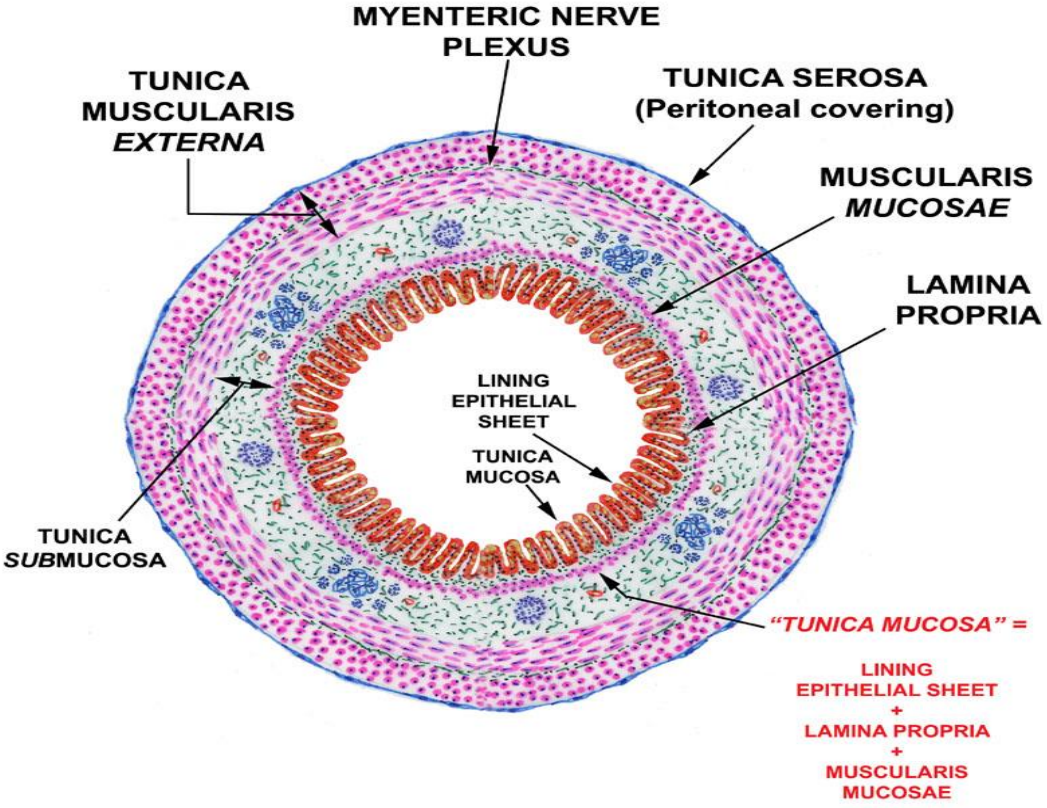
HISTOLOGY OF GASTROINTESTINAL TRACT



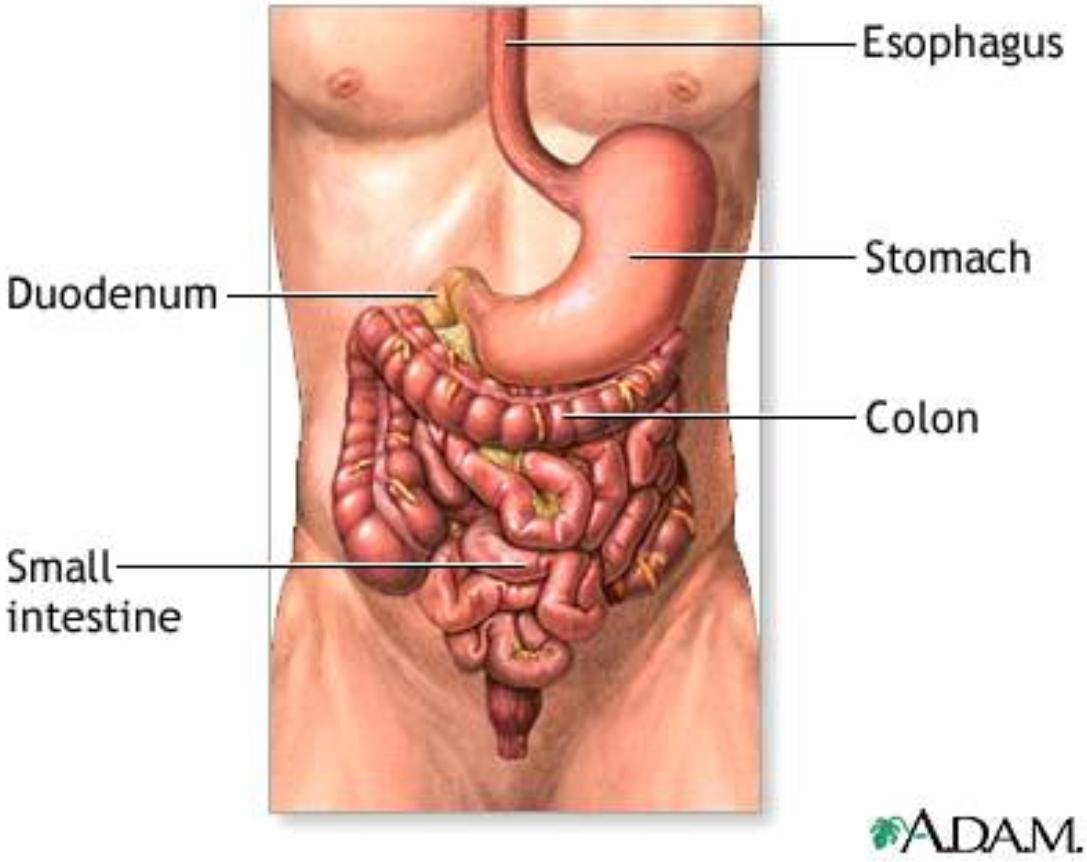
Contents

Oesophagus

Stomach

Small Intestine

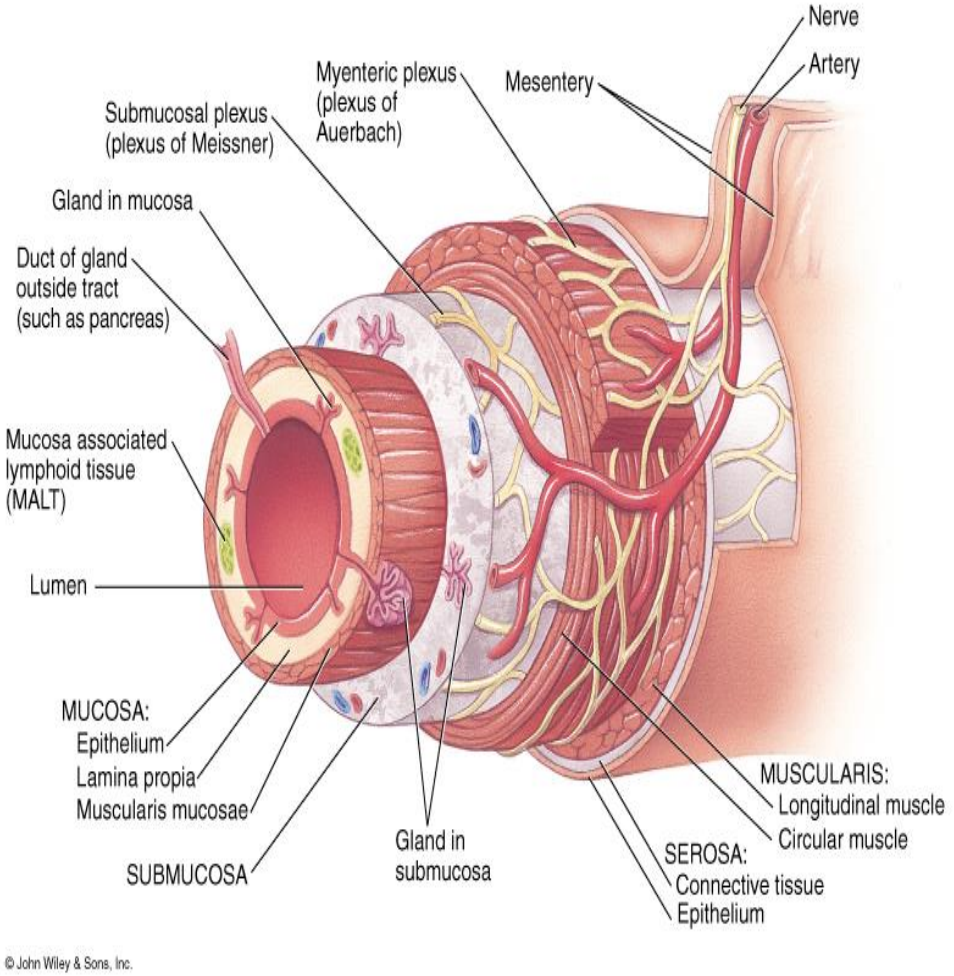
Large Intestine



Histology of the Digestive System

Basic Histological Layers:

1. **Mucosa:**
   a. **Epithelium**
   b. **Lamina Propria**
   c. **Muscularis Mucosae**
2. **Submucosa:**
   Submucosal plexus
   "Plexus of Meissner"
3. **Muscularis:**
   Myenteric plexus
   "Plexus of Auerbach
4. **Serosa**



Histology of the Mucosa

Organ	Epithelium
Mouth	Nonkeratinized Stratified Squamous
Pharynx	Nonkeratinized Stratified Squamous
Esophagus	Nonkeratinized Stratified Squamous
Stomach	Simple Columnar
Small Intestine	Simple Columnar
Large Intestine	Simple Columnar
Anus	Nonkeratinized Stratified Squamous

Histology of the Mucosa

Organ	Folds of the epithelium
Esophagus	none
Stomach	Rugae , gastric pits
Small Intestine	Plicae circulares , Villi , Crypts of Lieberkuhn , microvilli
Large Intestine	Intestinal glands

Histology of the Submucosa

Organ	Specialized structures
Esophagus	Submucosal mucous glands
Stomach	None
Duodenum	Brunner's glands
Ileum	Peyer's Patches
Large Intestine	None

Histology of the Muscularis

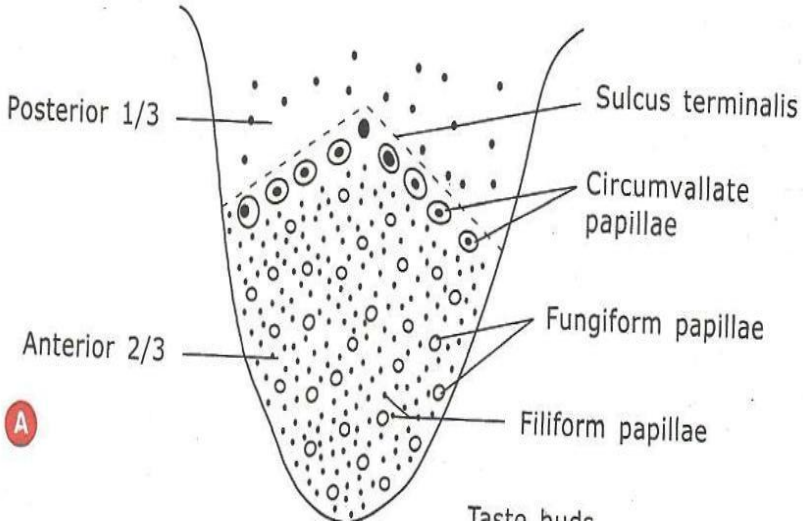
Organ	Smooth muscle layers
Esophagus	2, circular and longitudinal
Stomach	3, oblique, circular, and longitudinal
Small Intestine	2, circular and longitudinal
Large Intestine	2, circular and longitudinal

Histology of the Serosa

Organ	Serosa
Esophagus	Adventitia due to the fact that the esophagus is not in a cavity
Stomach	Visceral Peritoneum
Small Intestine	Visceral Peritoneum
Large Intestine	Visceral Peritoneum
Anus	Adventitia

Tongue

- An accessory digestive organ.
- Composed of skeletal muscle covered with mucous membrane.
- Mucosa: Stratified squamous epithelium & lamina propria.
- Sulcus terminalis divides the dorsal aspect of tongue into anterior 2/3rd and posterior 1/3rd part.



Lingual Papilla

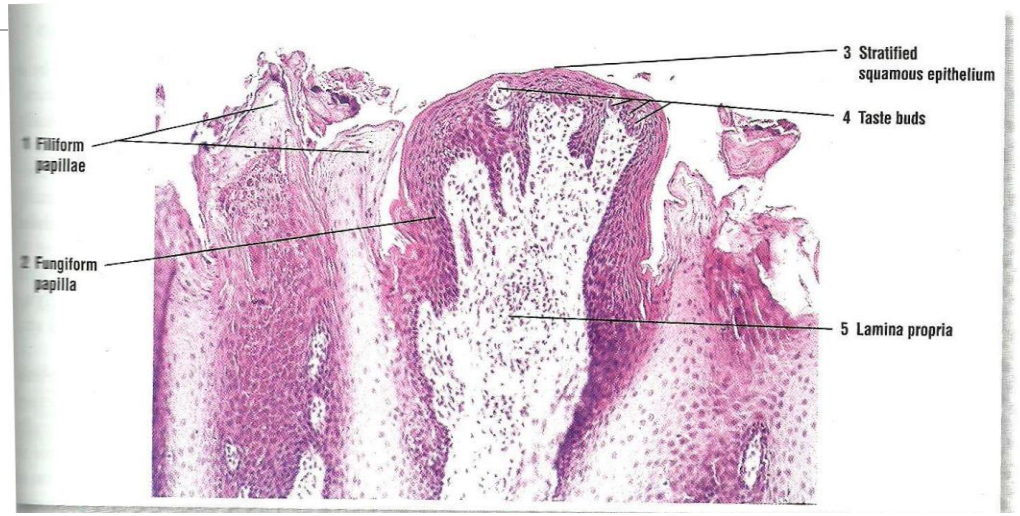
Lingual papilla: projections of lamina propria covered with stratified squamous epithelium.

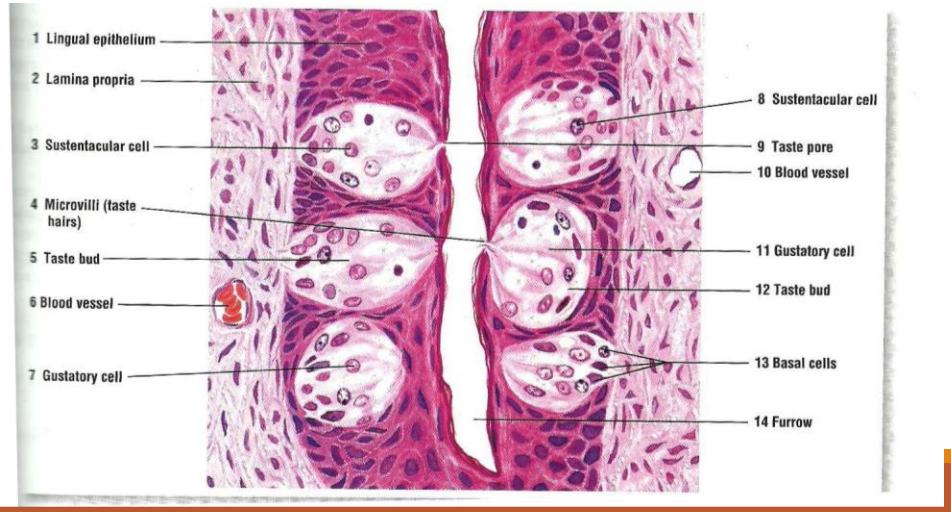
May be keratinized.

Many papillae contain **taste buds.**

4 types:

Filiform, fungiform, circumvallate and foliate.





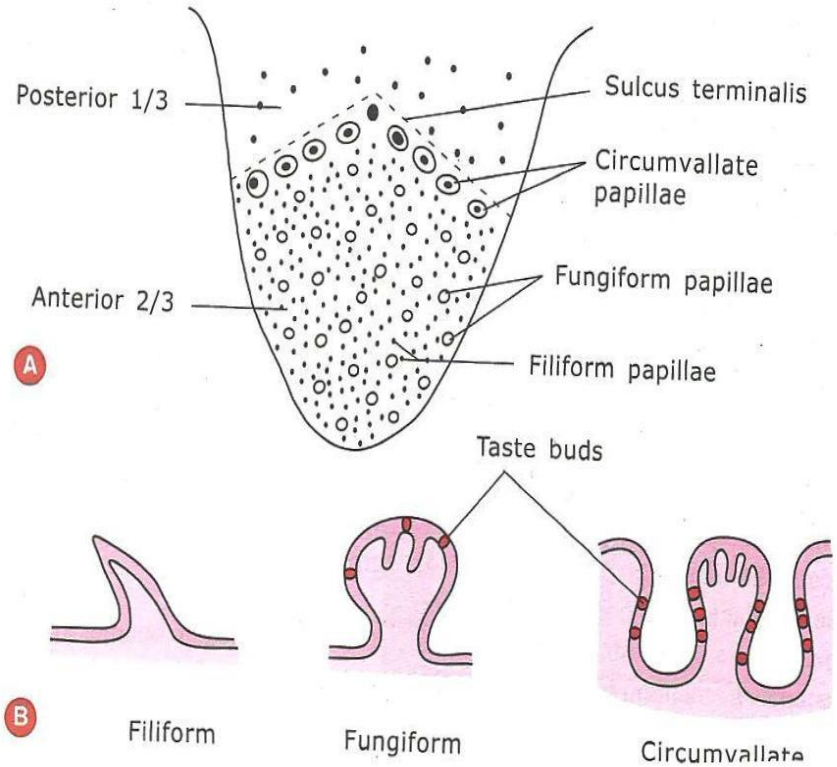
Types of Papillae

Filiform papilla: most numerous, conical with keratinized tips, **no taste buds.**

Fungiform papilla: mushroom shaped, highly vascularized connective tissue core, taste buds present.

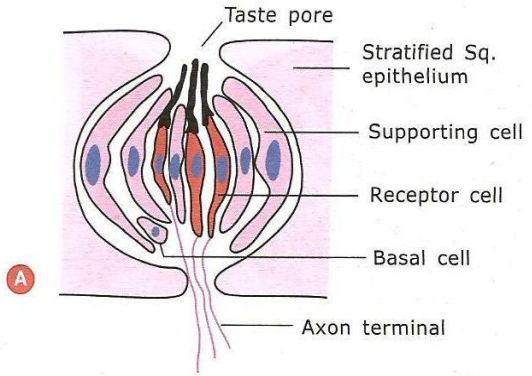
Circumvallate papilla: surrounded by a circular trench, openings of the ducts of **serous glands of Von Ebner**.

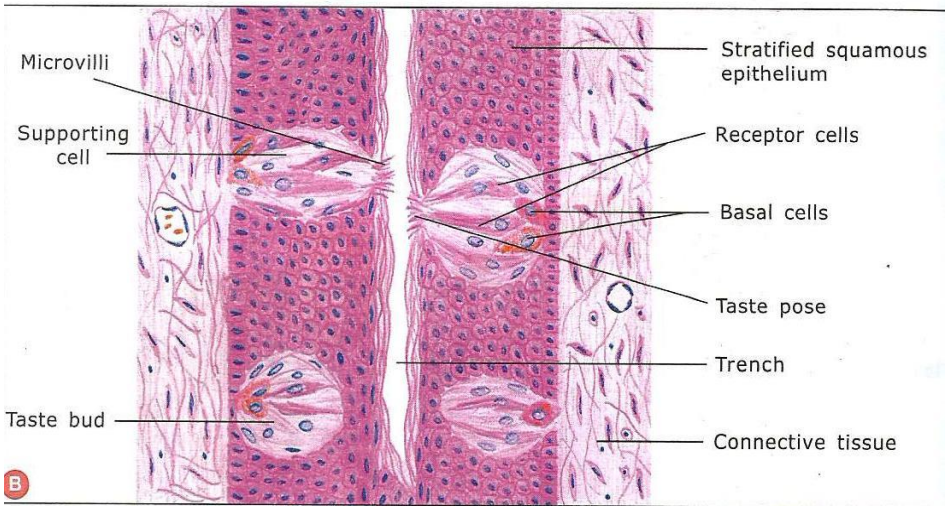
Foliate papilla: not well developed in humans.



Taste Buds

- **Neurosensory epithelial structures embedded in the surface epithelium of fungiform and circumvallate papilla.**
- **Appear as onion-like, oval, pale staining structures.**
- **Extends through the full thickness of epithelium.**
- **Opens on the surface through taste pore.**
- **3 types: Receptor cells, supporting cells and basal cells.**





Muscles of the tongue

- Contains striated muscle.
- Muscle fibres are arranged in transverse, longitudinal and vertical bundles.
- Loose connective tissue, adipose tissue and lingual glands are present in between the muscle bundles.

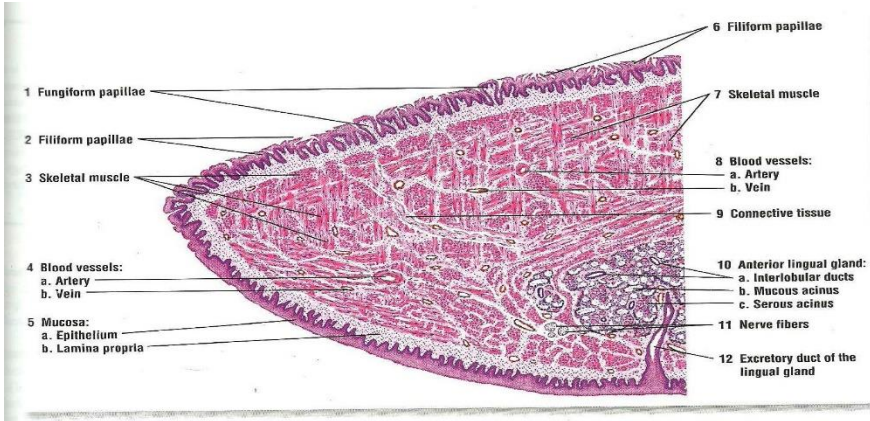


FIGURE 13.2 ■ Anterior region of the tongue: apex (longitudinal section). Stain: hematoxylin and eosin. Low magnification.

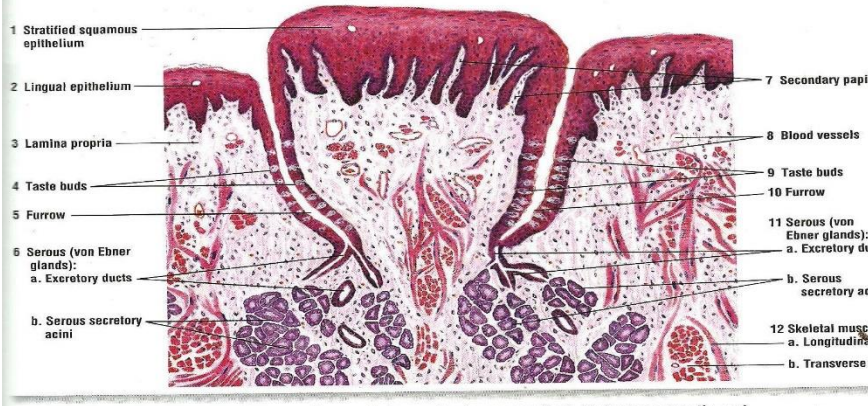


FIGURE 13.3 ■ Tongue: circumvallate papilla (cross section). Stain: hematoxylin and eosin. Medium magnification.

Oesophagus

Mucosa: Stratified squamous non - keratinized epithelium

Submucosa: contains Meissner's plexus and oesophageal glands

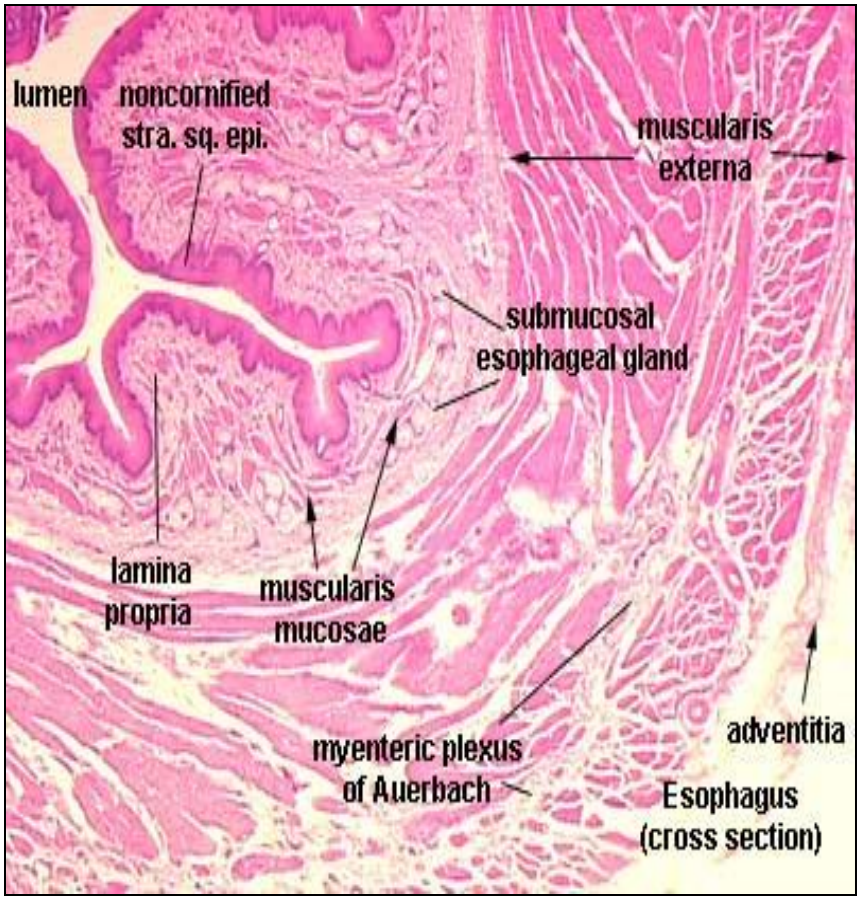
Muscularis externa:

Upper one-third: skeletal fibres

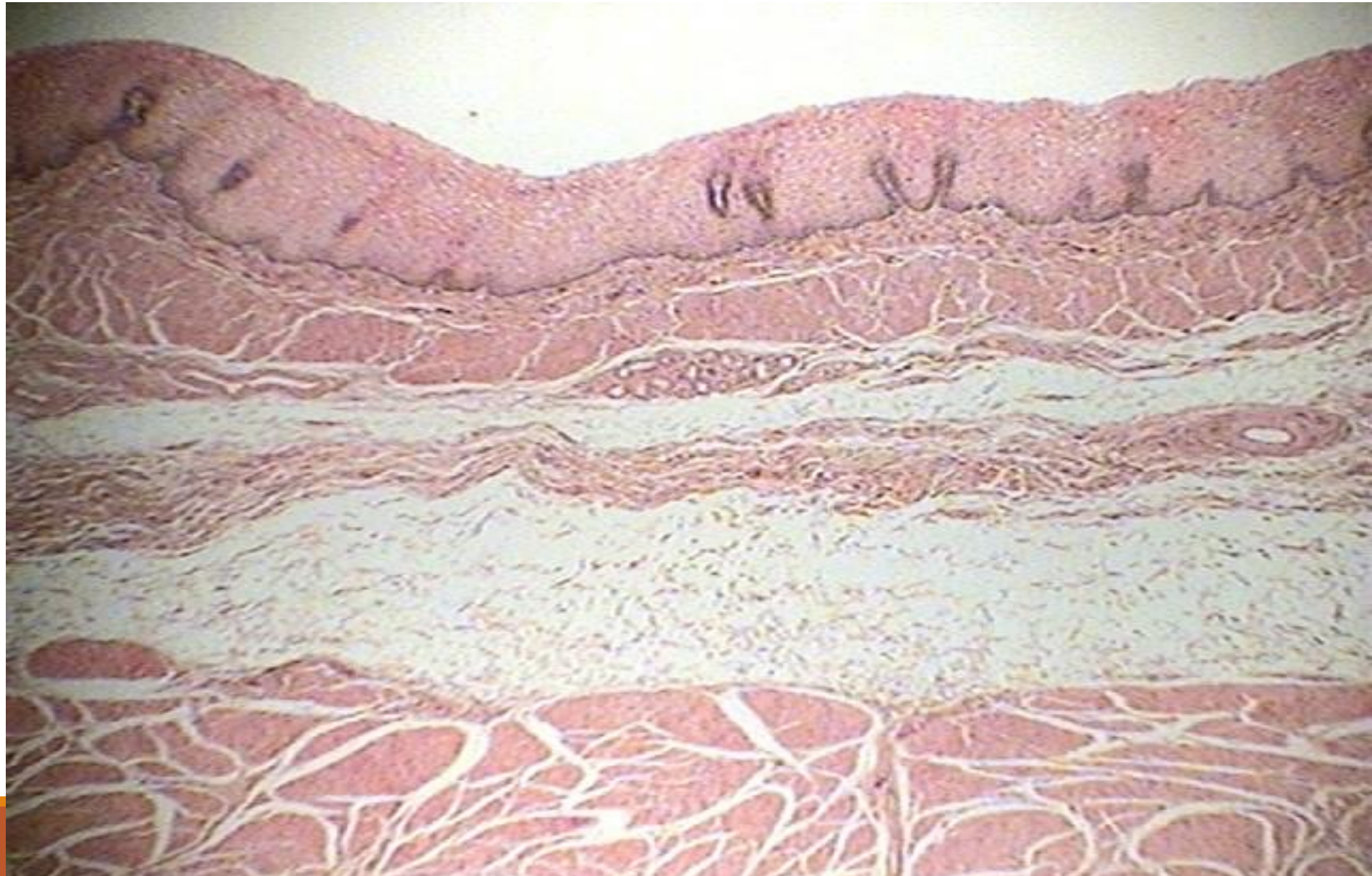
Middle one-third: mixed fibres

Lower one-third: smooth fibres

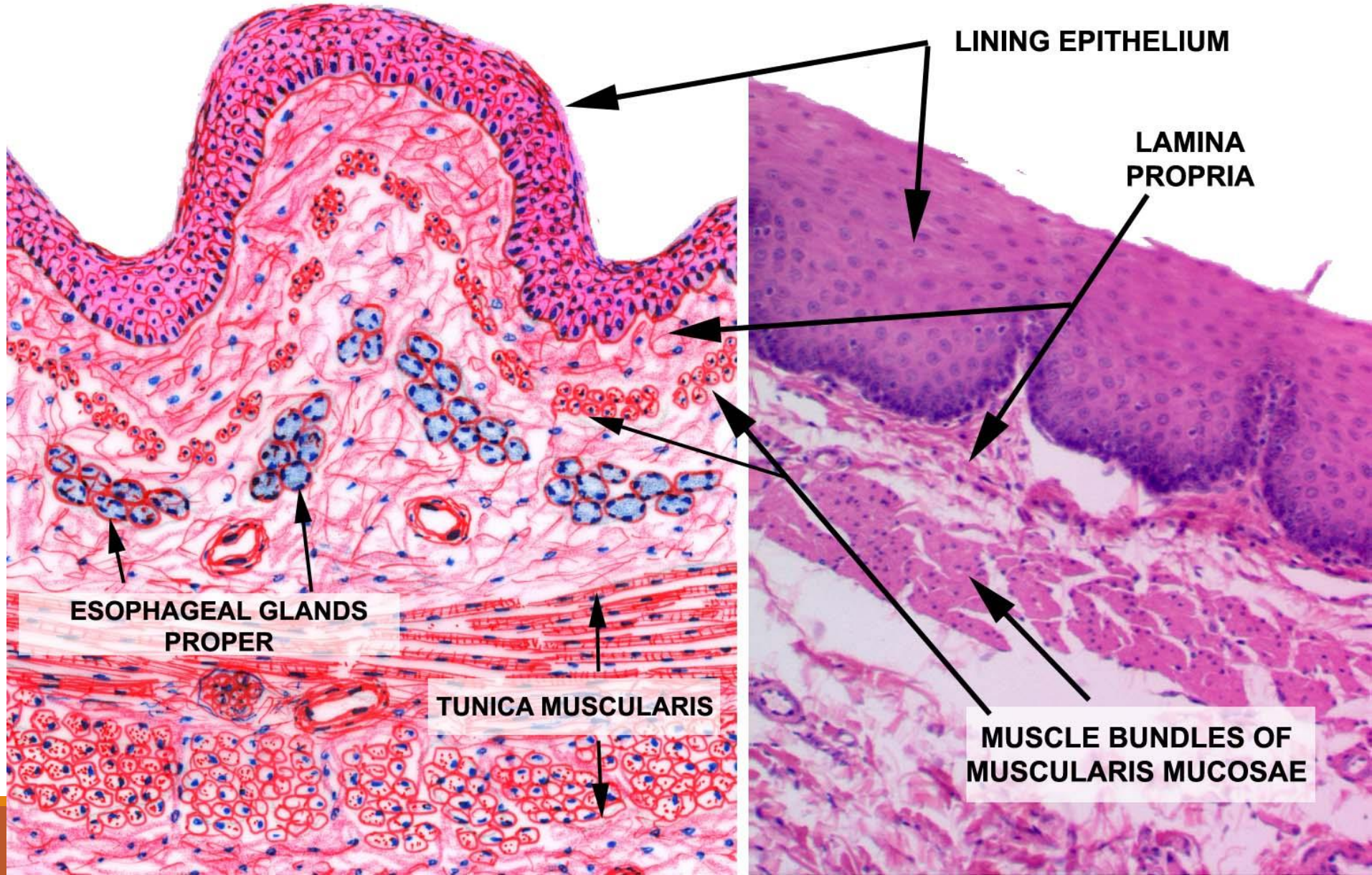
Adventitia: loose areolar connective tissue

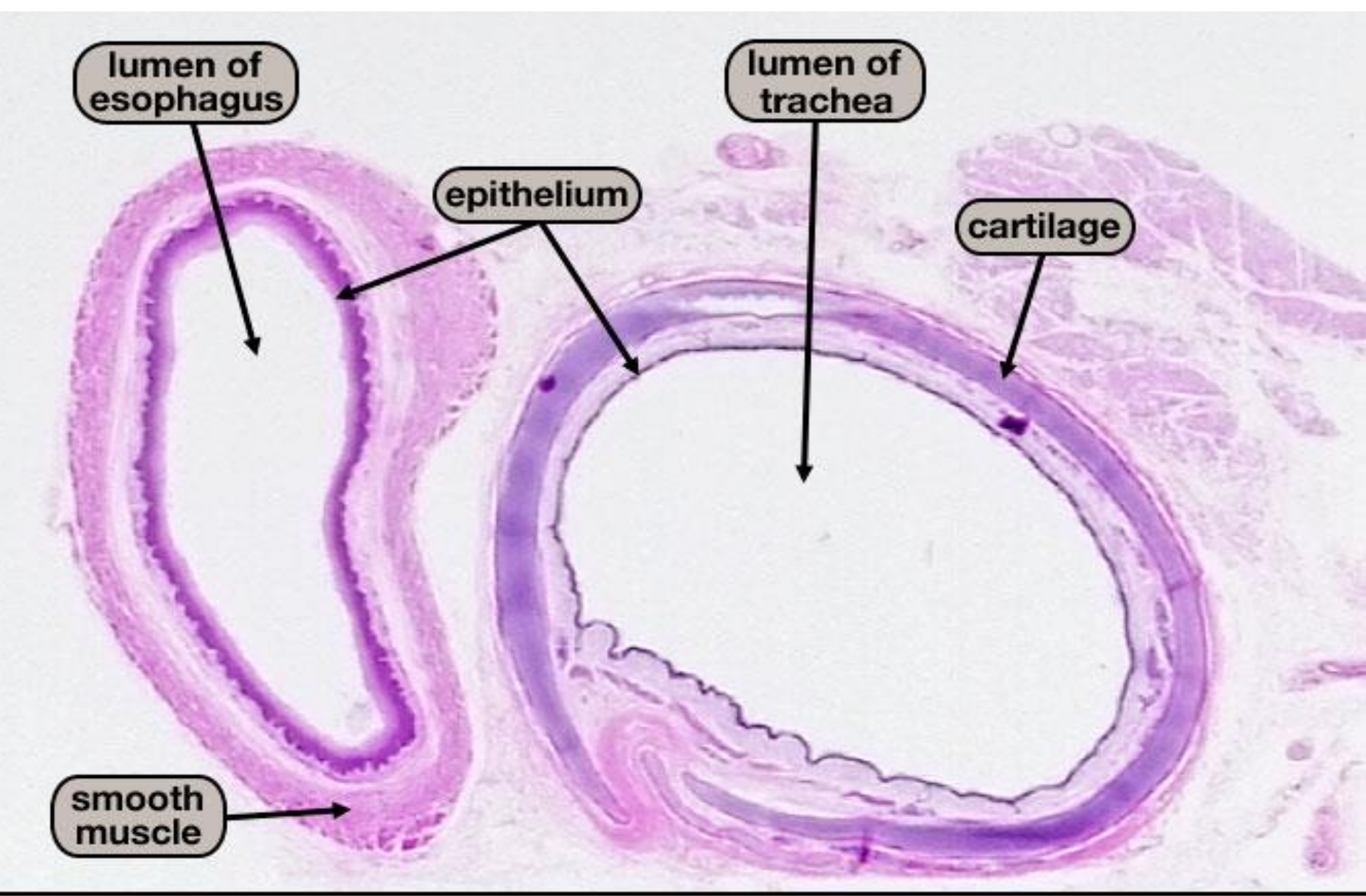


Oesophagus



Oesophagus


LINING EPITHELIUM
LAMINA PROPRIA
ESOPHAGEAL GLANDS PROPER
TUNICA MUSCULARIS
MUSCLE BUNDLES OF MUSCULARIS MUCOSAE



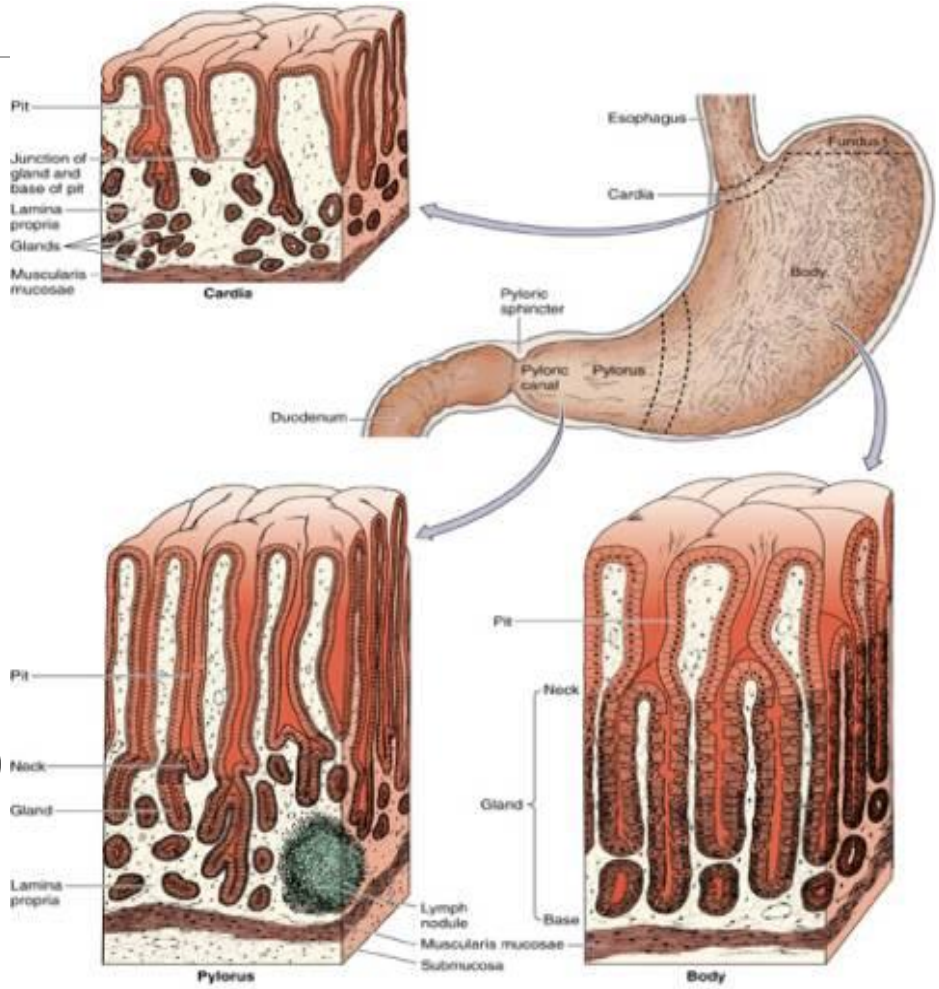
Esophagus and trachea

Stomach

Mucosa:simple columnar epithelium and presence of gastric pits.

Stomach is divided into three histological regions on the basis of nature of glands:

- Cardiac region
- Fundic region (fundus & body)
- Pyloric region



Stomach (Cardiac Region)

Mucosa: simple columnar with oval nuclei, mucous secreting cardiac glands in lamina propria.

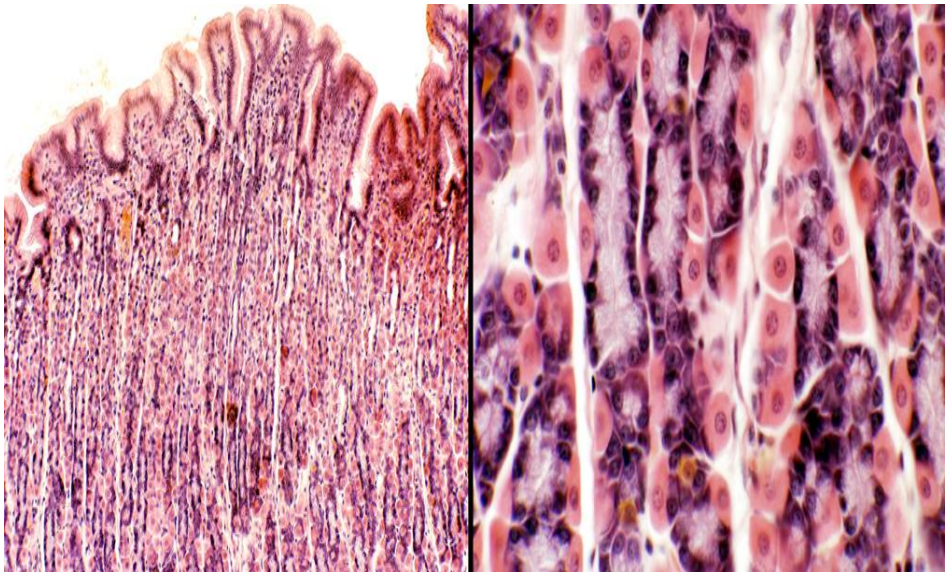
Submucosa: connective tissue.

Muscle layer: inner circular, outer longitudinal.

Serosa: simple squamous epithelium.

Stomach (Fundic Region)

Mucosa: simple columnar with oval nuclei, presence of gastric glands in lamina propria.



Stomach (Fundic Region)

Cells of fundic region:

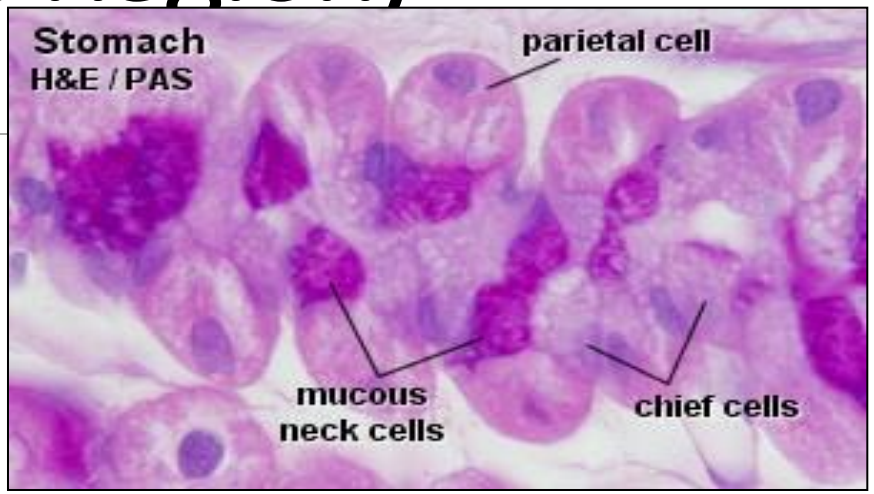
Mucous neck cells

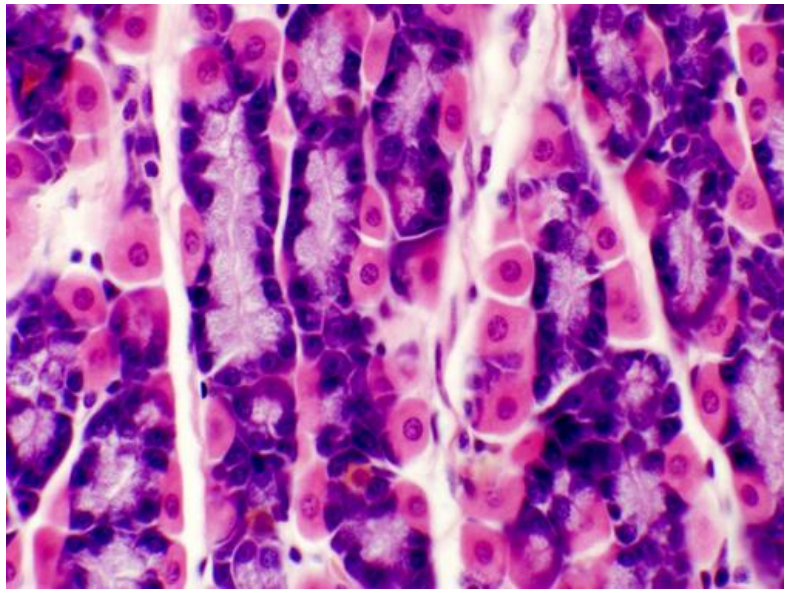
Parietal (oxyntic) cells

Chief (peptic/zymogen) cells

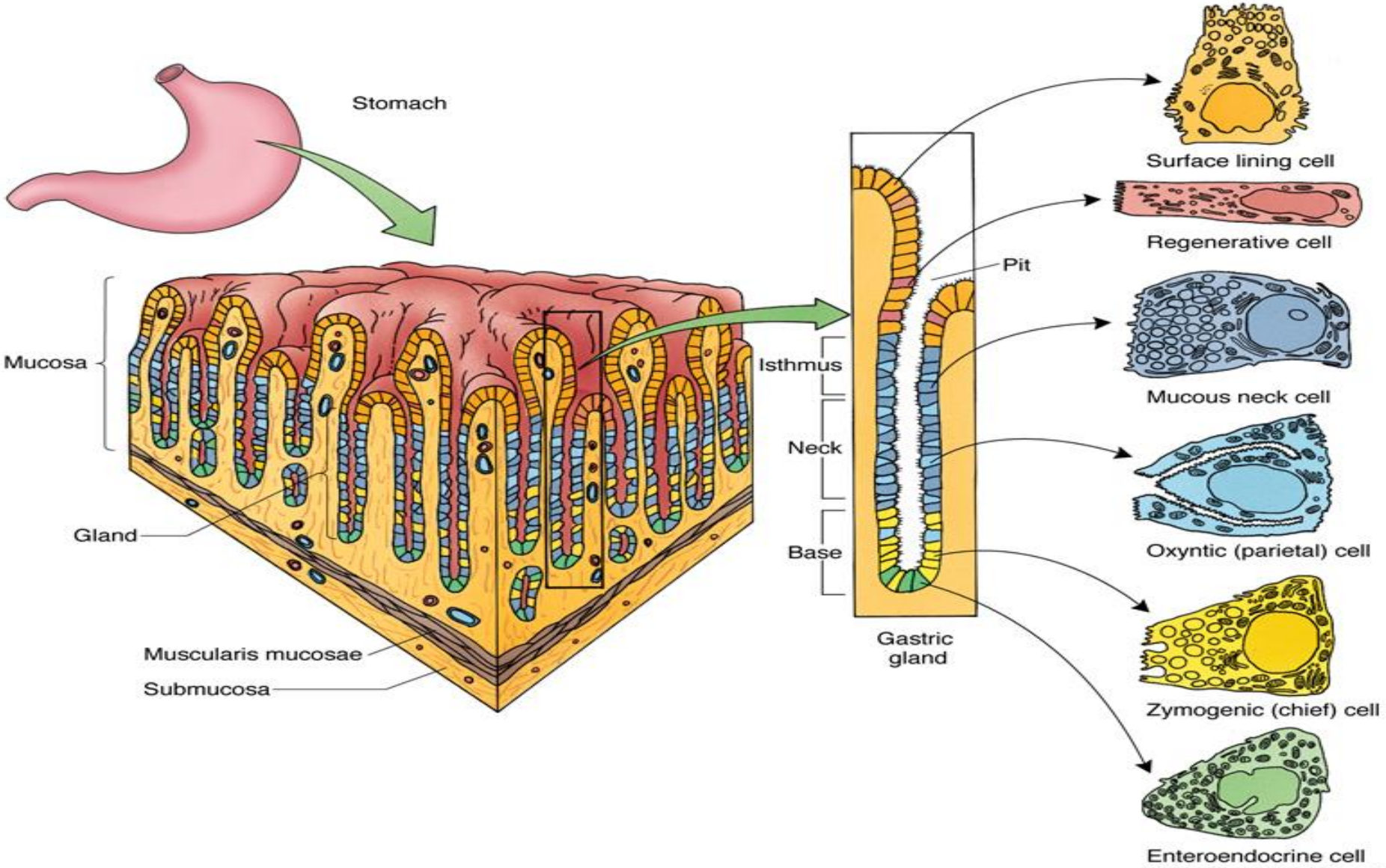
Enteroendocrine cells

Undifferentiated cells

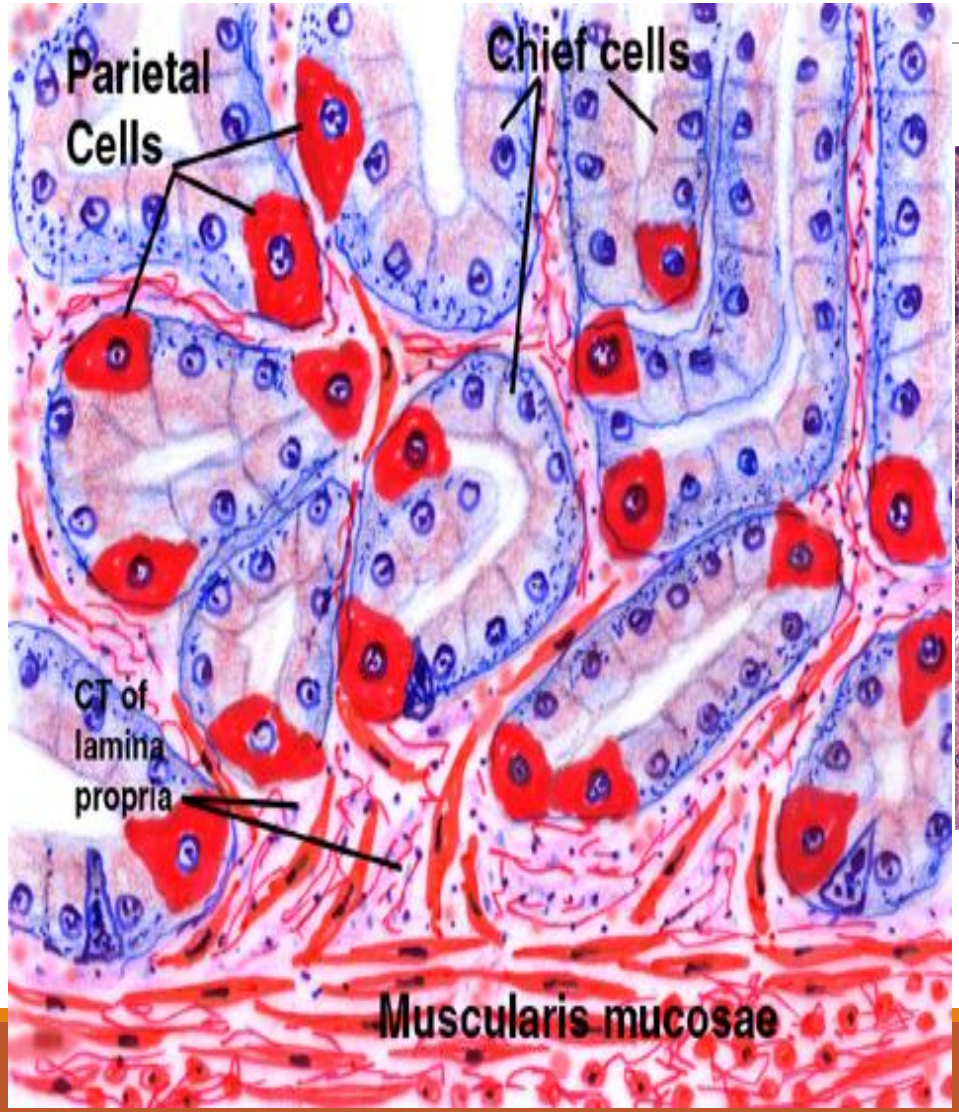


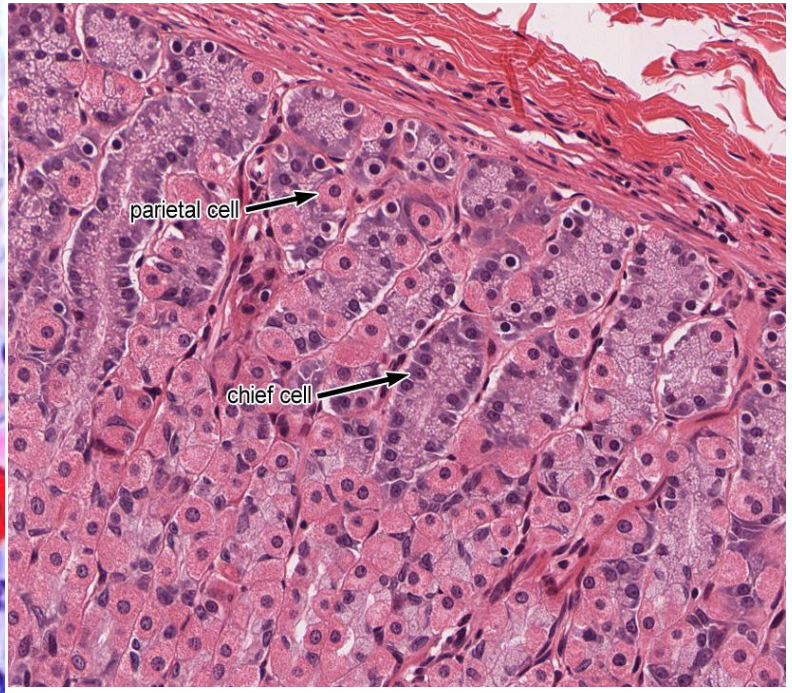


Cells of fundic region



Cells of fundic region





Stomach (Fundic Region)

Submucosa: contains blood vessels, lymphatics and Meissner's plexus.

Muscularis Externa: an inner oblique (absent in pylorus), middle circular and outer longitudinal layer.

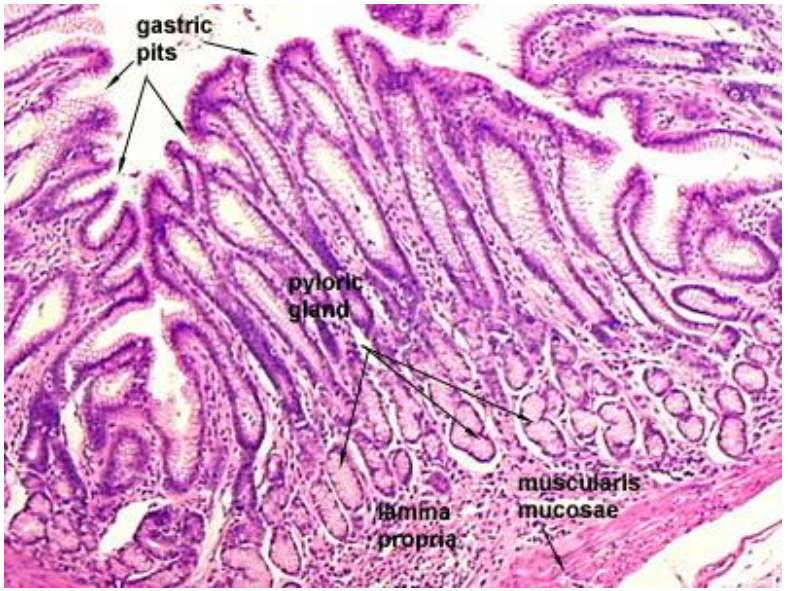
Serosa: consist of surface layer of flattened mesothelial cells resting on a thin layer of loose connective tissue with blood vessels and lymphatics.

Stomach (Pyloric Region)

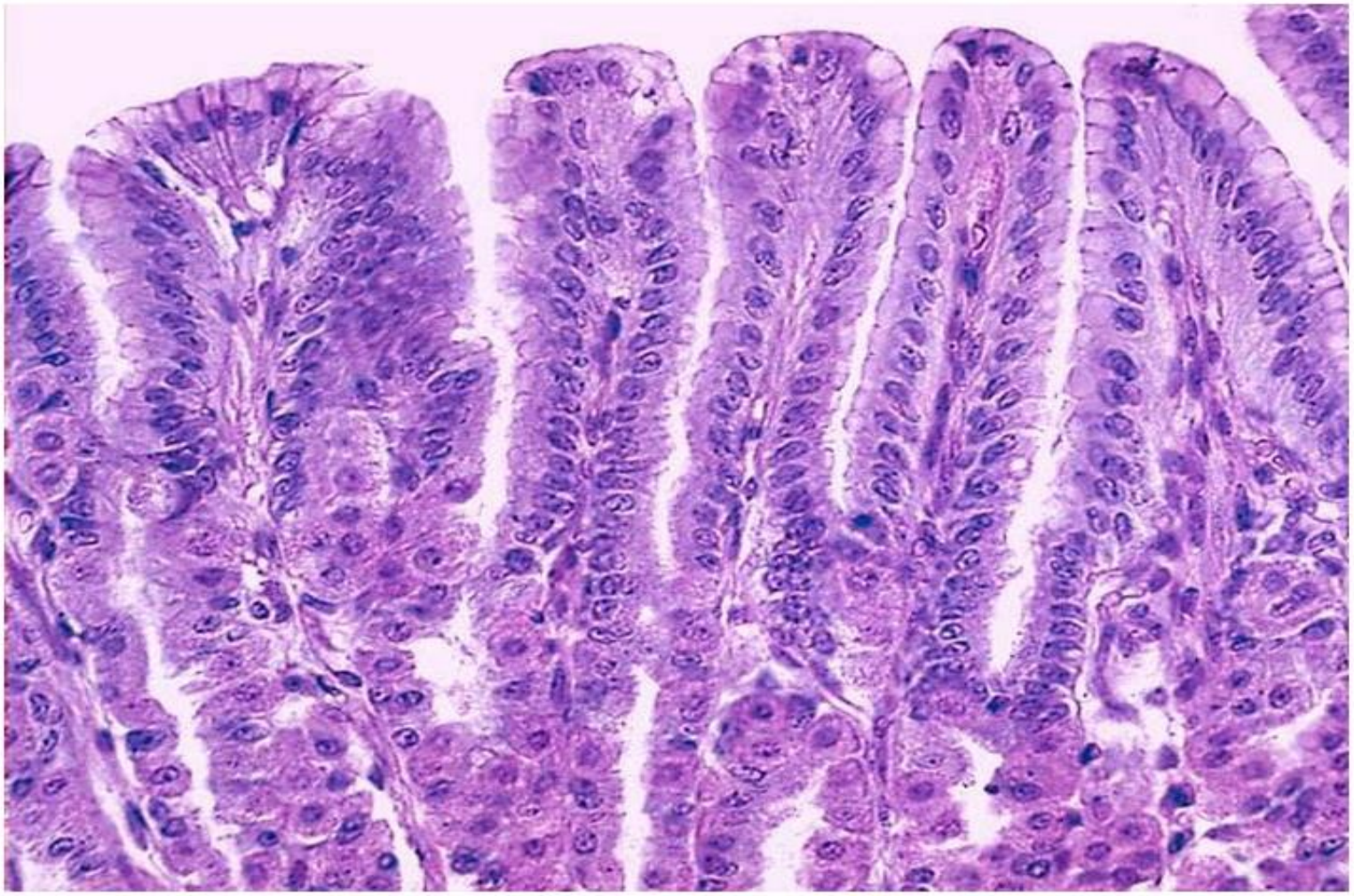
Mucosa: pyloric glands in lamina propria & **deeper gastric pits extending half the thickness of mucosa.**

Muscularis Externa: inner circular **(thickened to form pyloric sphincter)** and outer longitudinal layer.

Submucosa & Serosa: same as in fundic part.



Stomach (Pyloric Region)



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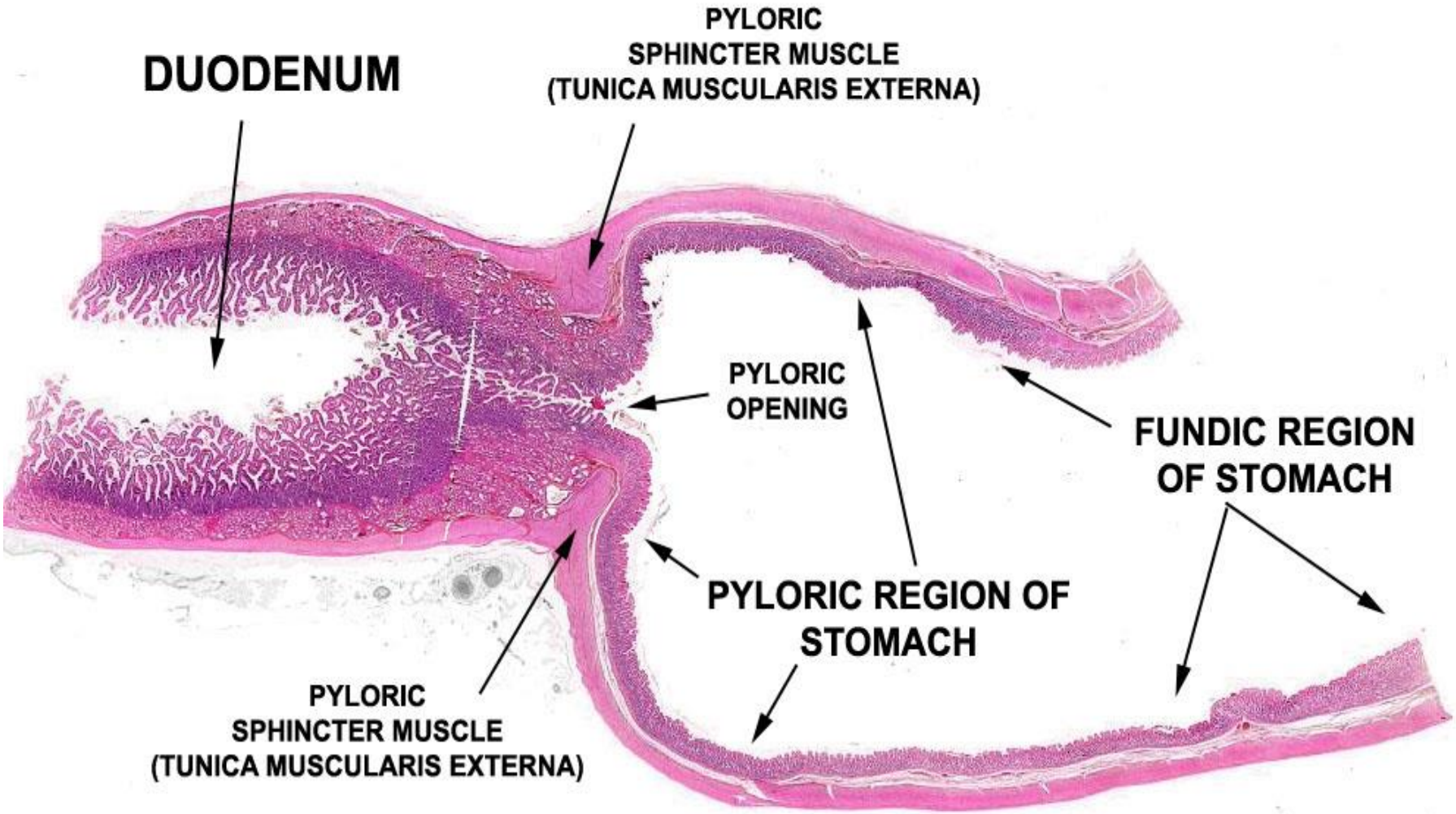
Pyloric Glands



Liver

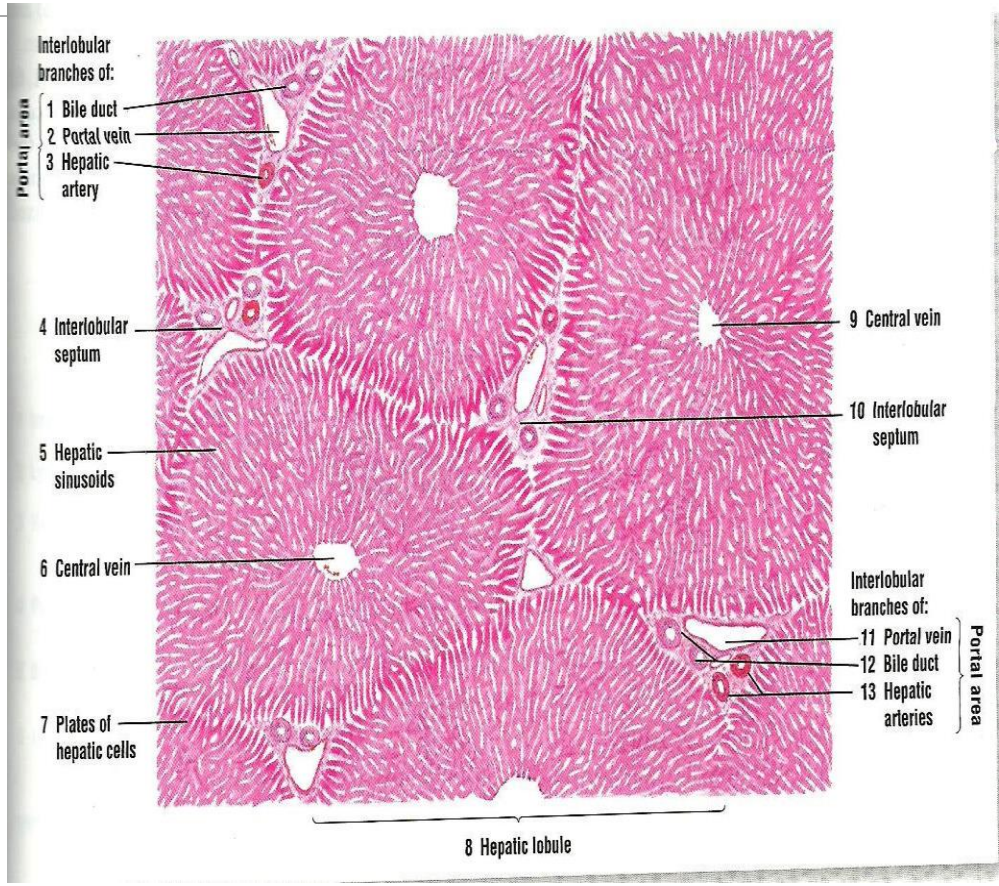
Modified exocrine gland.

Made up of liver cells (hepatocytes).

Hepatic lobules: hexagonal areas that form the structural & functional unit of liver.

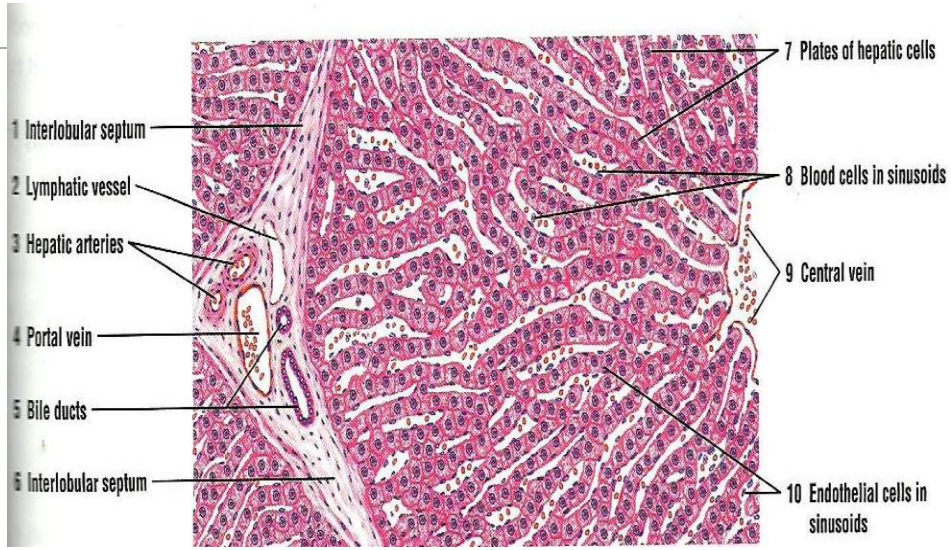
Scanty connective tissue between lobules.

Each lobule is made up of cords of liver cells separated by sinusoids.

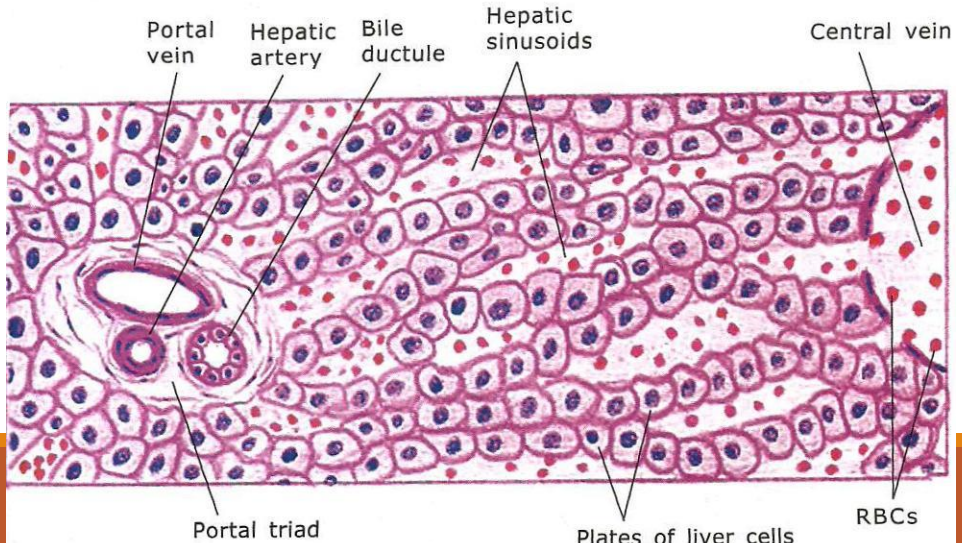


Liver

Portal canals contain branches of portal vein, hepatic artery & interlobular bile duct **(portal triad).**



Central vein: in the centre of each lobule, drains blood from lobules into hepatic veins.

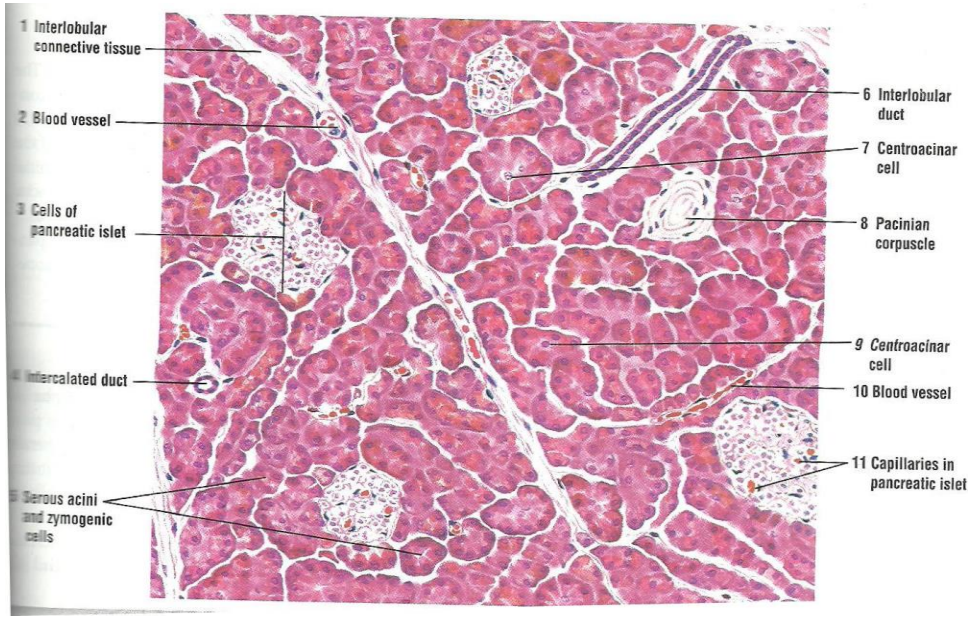


Pancreas

Mixed gland i.e. consists of an exocrine & endocrine portion.

Exocrine part: secretes pancreatic juice.

Endocrine part: secretes hormones.



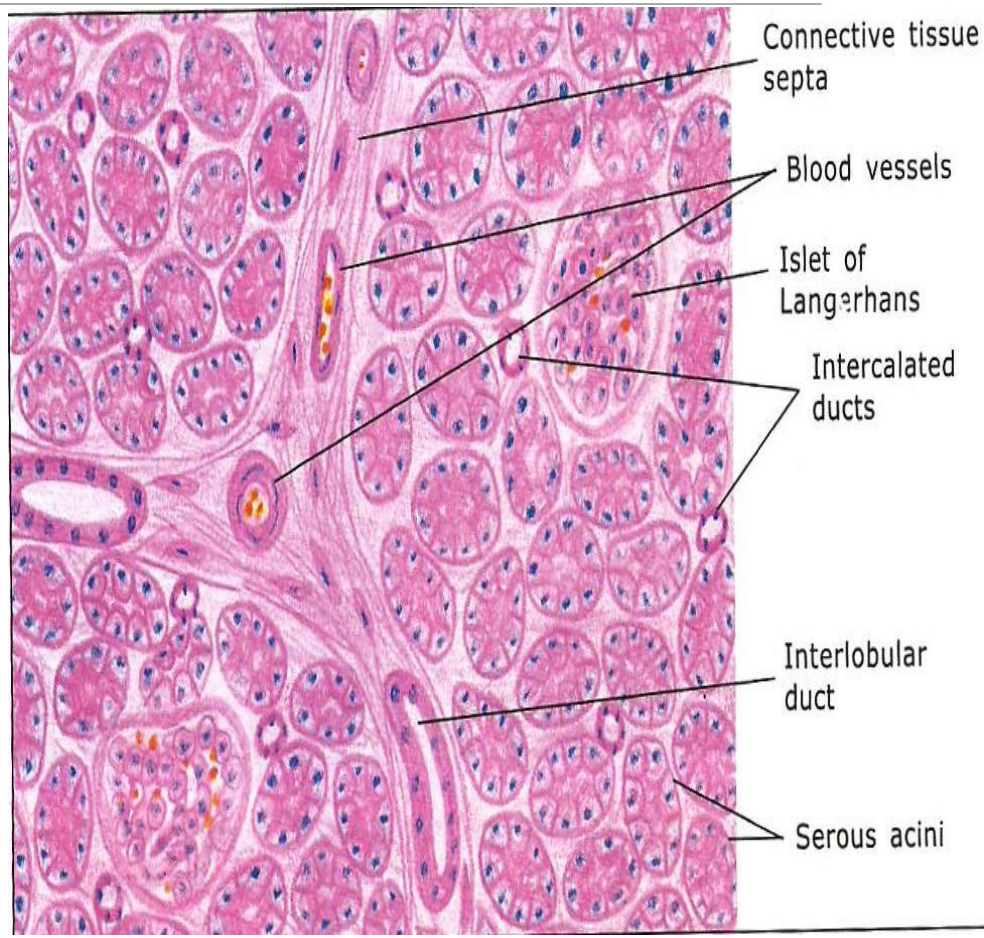
Histology of Exocrine Pancreas

Covered with a capsule.

Septas arise from capsule which divide the gland into many small lobules.

Interlobular connective tissue contains large ducts, blood vessels & nerve fibres.

Interlobular connective tissue surrounds the acini, small ducts & islets of Langerhans.



Pancreatic Acini

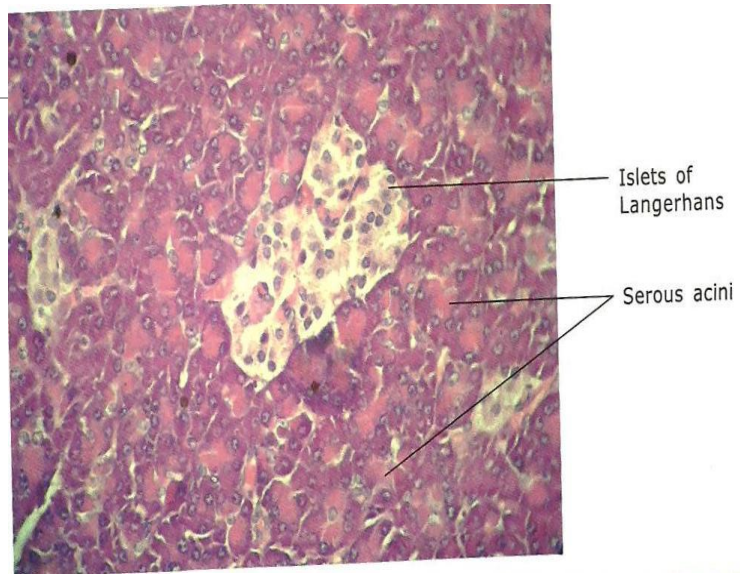
Serous in nature.

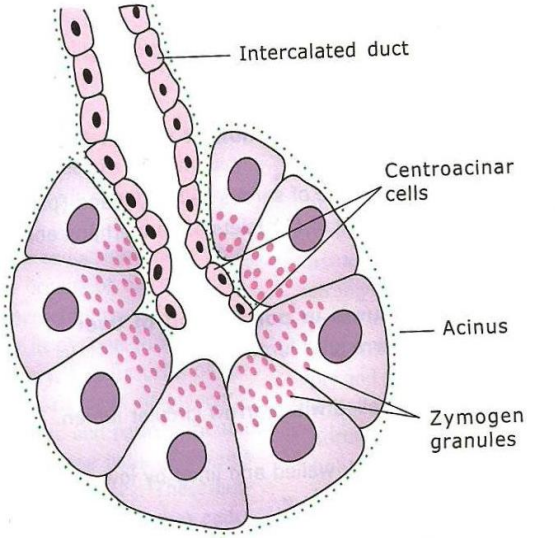
Lined by pyramidal cells and have small lumen.

Acinar cells: supranuclear region is filled with zymogen granules. Infranuclear region is intensely basophilic.

Extensive duct system: intralobular, interlobular & main duct.

Acinar lumen may show pale staining cells of intercalated duct **(centroacinar cells)**.





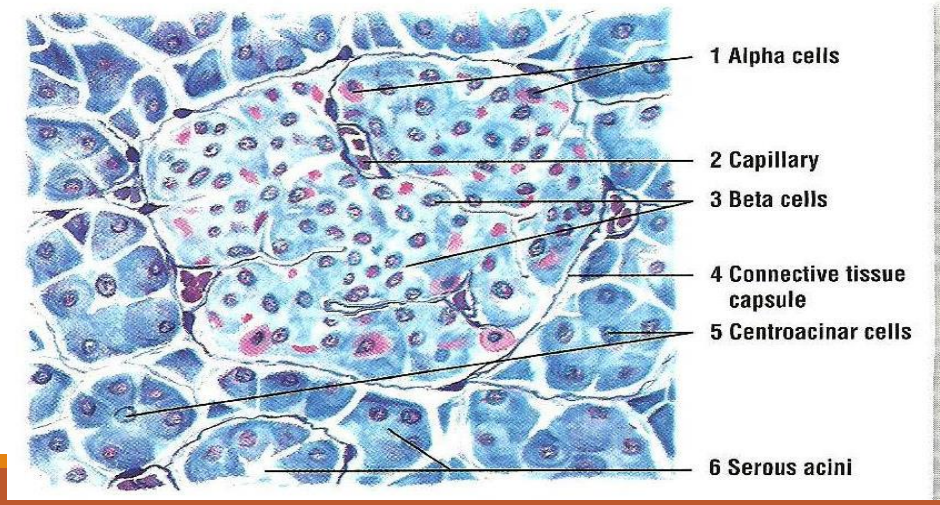
Histology of Endocrine Pancreas

In the form of “islands”: **Islets of Langerhans** (lightly stained with H&E).

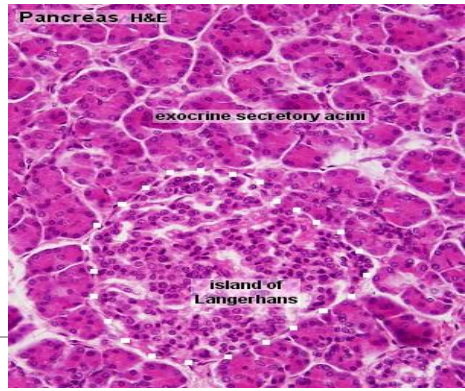
Scattered among the acini of exocrine part.

Cells of islets are arranged as anastomosing plates.

Islets contain 3 types of cells: Alpha, Beta & Delta which are seen with special stains.

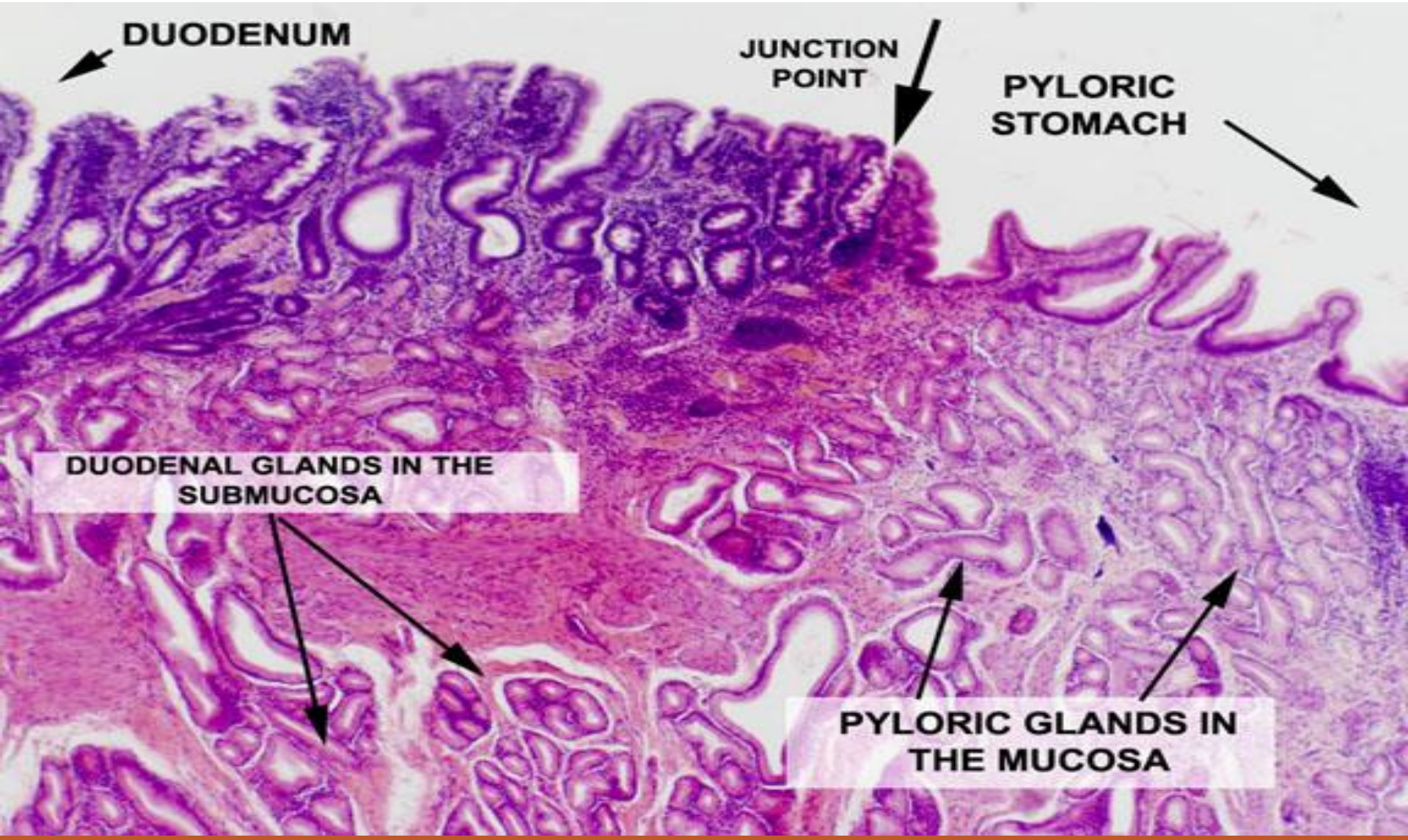


(pancreas islet) Langerhans Cells



	A cell	B cell	D cell	PP cell
Secretion	Glucagon-- Increase blood glucose levels blood glucose levels	Insulin-- Decrease blood glucose levels	Somatostatin— Inhibit the secretion of other cells	Pancreas polypeptide

Gastro-Duodenal Junction

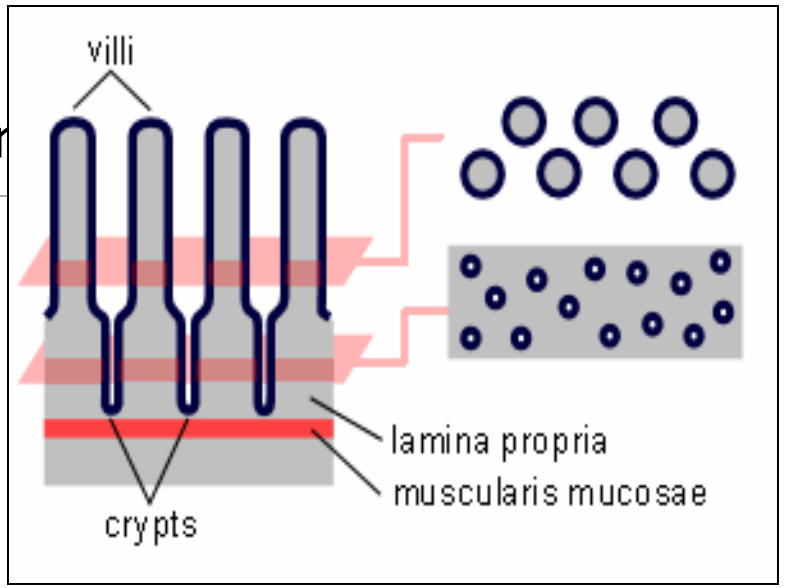


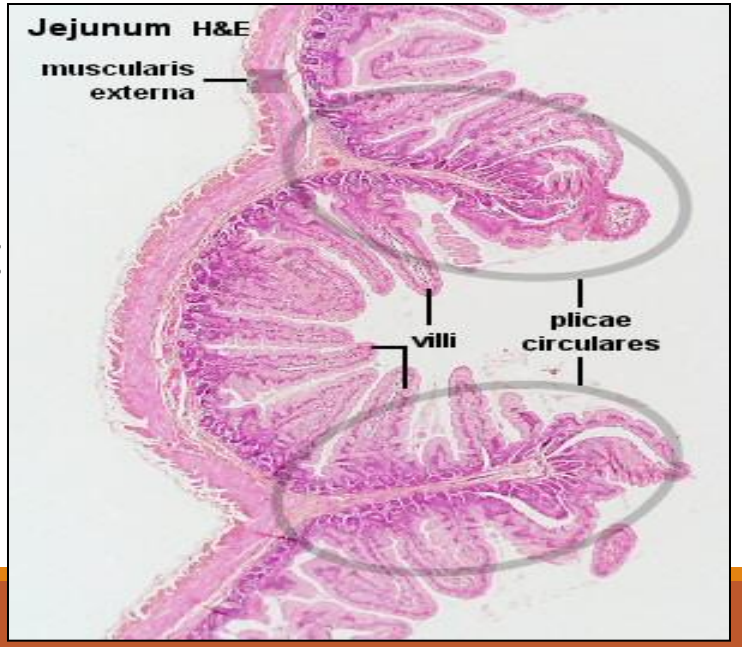
Small Intestine

It is divided into duodenum, jejunum ar
ileum.

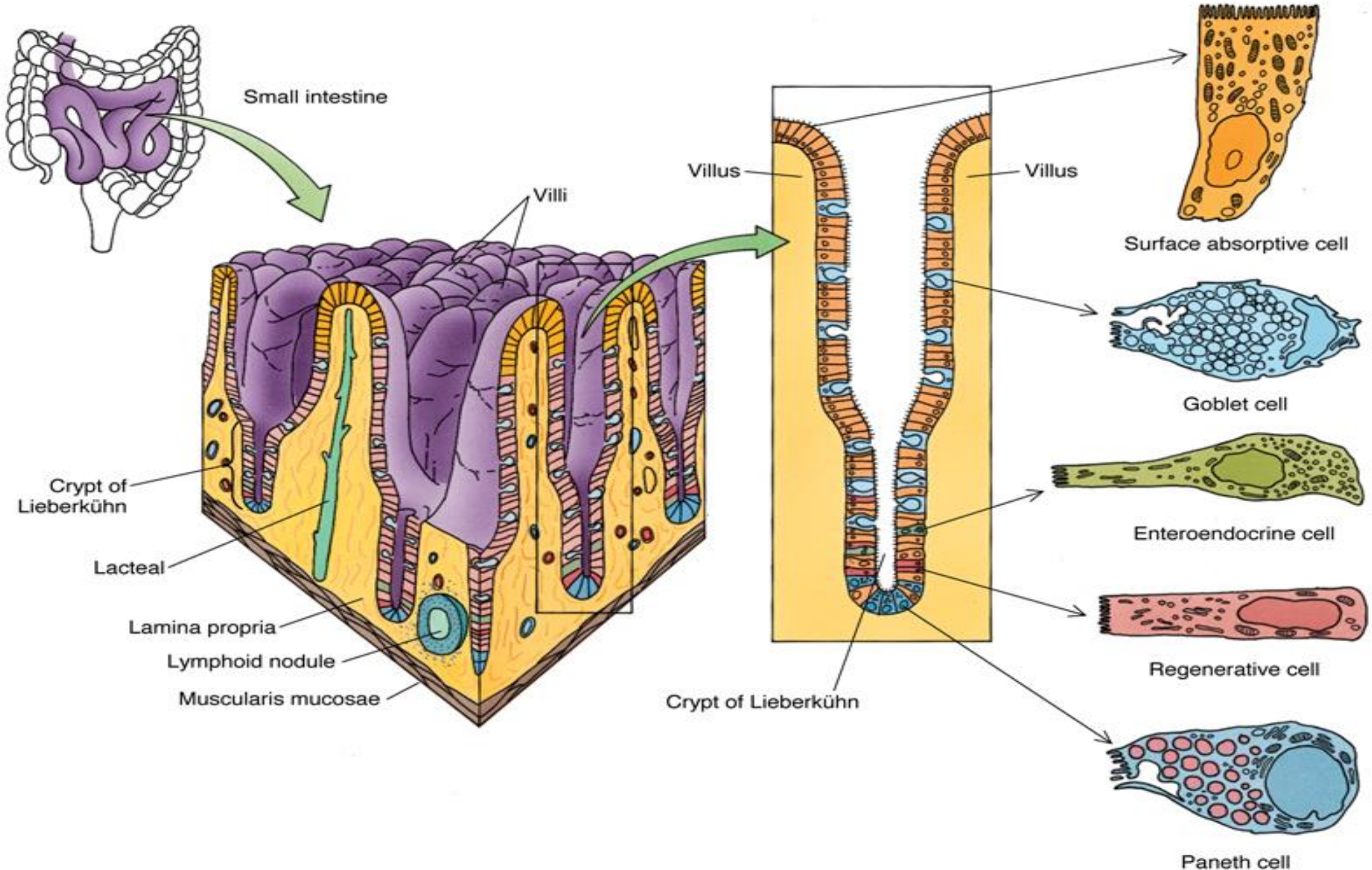
Mucosa: characteristic features-

- ✓Plicae circularis (valves of Kerkring)
- ✓Villi & Microvilli
- ✓Goblet cells (few)
- ✓Crypts of Lieberkuhn (intestinal glands)
- ✓Glands are lined by columnar cells, goblet cells, Paneth cells & enteroendocrine cells





Small Intestine

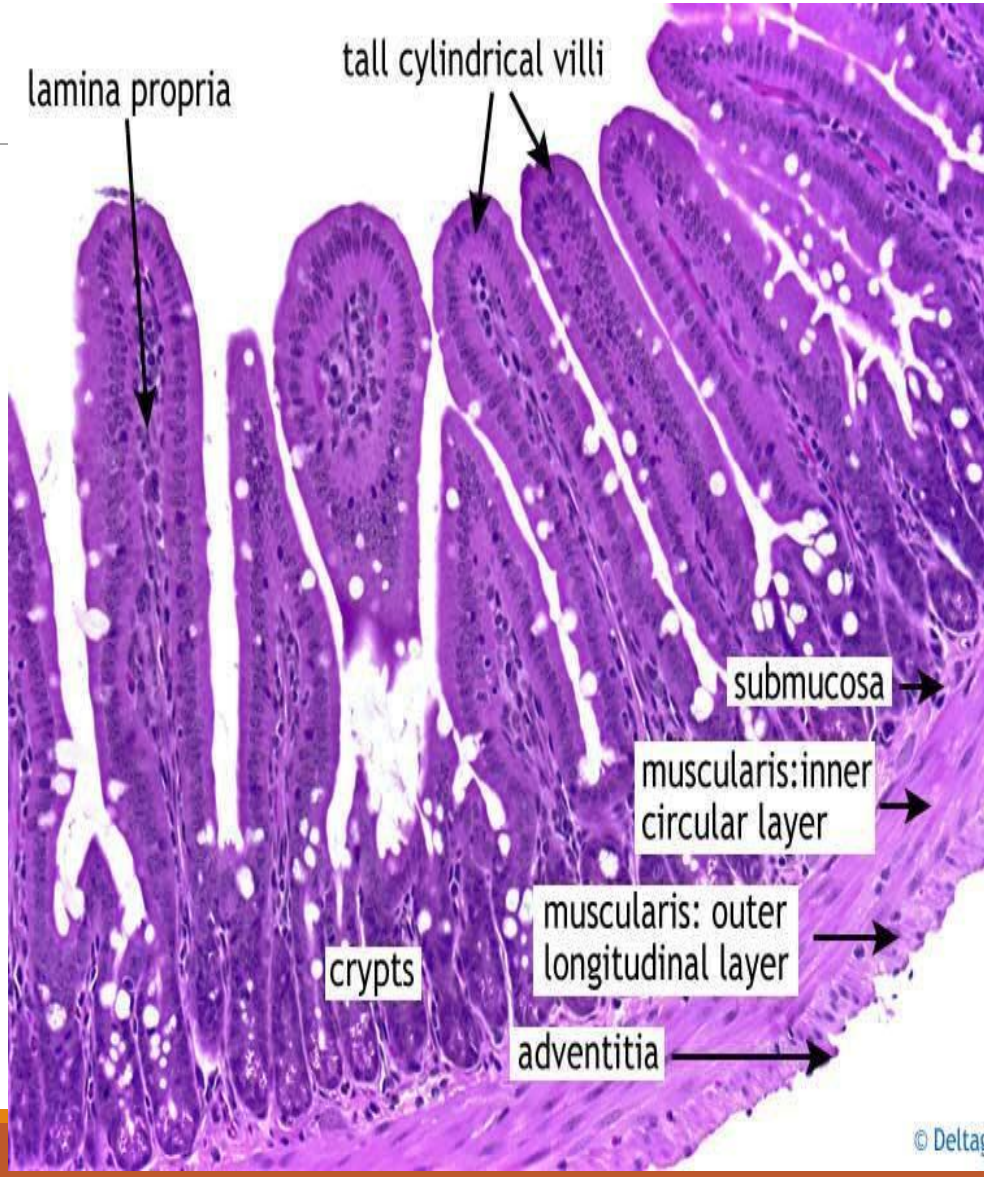


Small Intestine

Submucosa: contains blood vessels, lymphatics and Meissner's plexus.

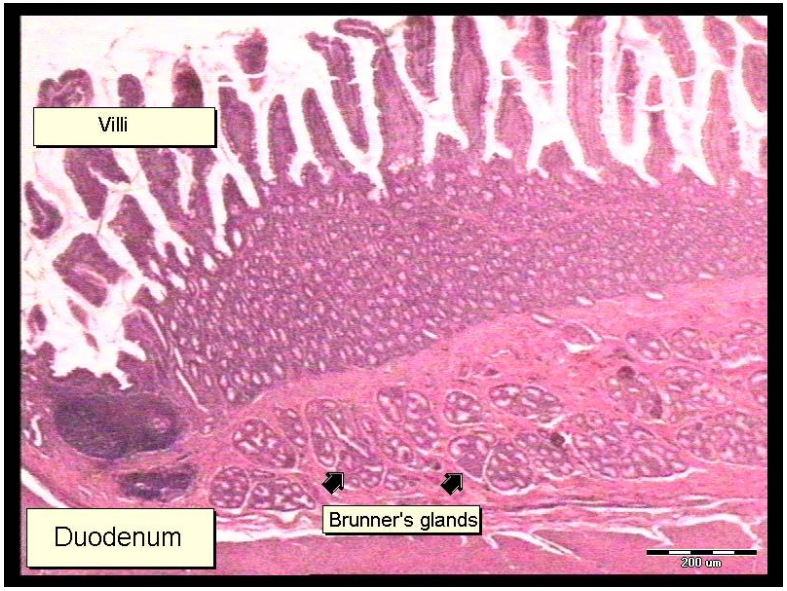
Muscularis externa: Outer longitudinal and inner circular layers of smooth muscle.

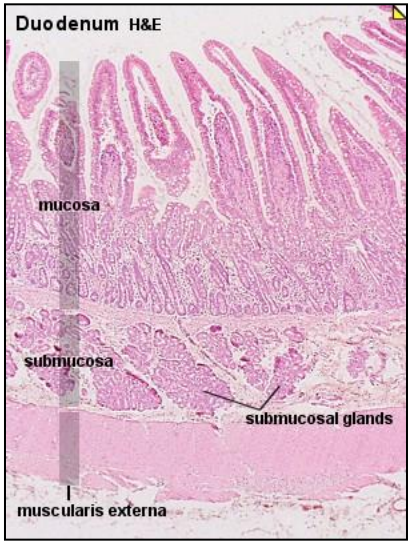
Serosa/Adventitia



Duodenum

Presence of Brunner's glands in submucosa



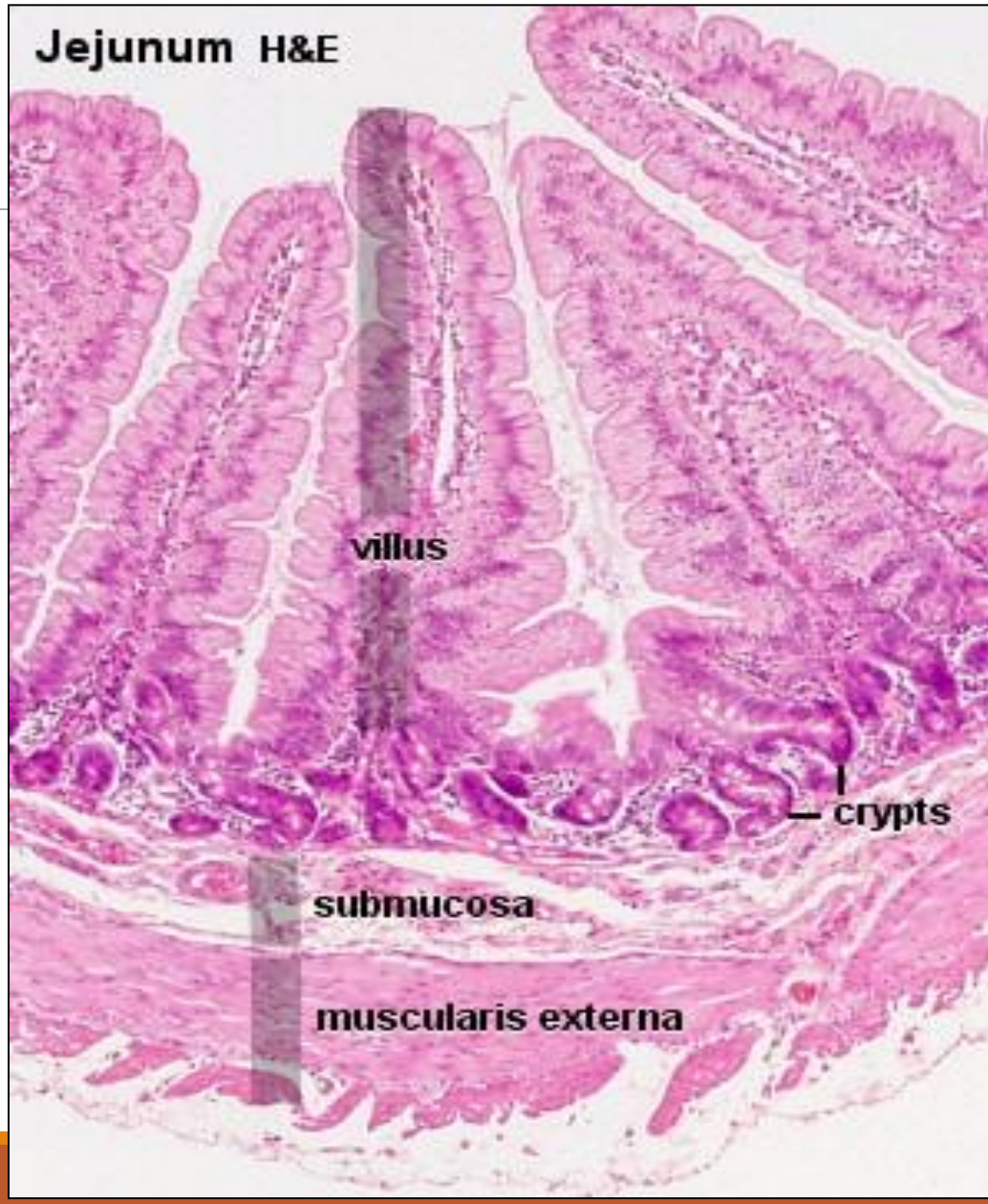


High power view of the Duodenal Mucosa

Jejunum

Villi are tongue shaped.

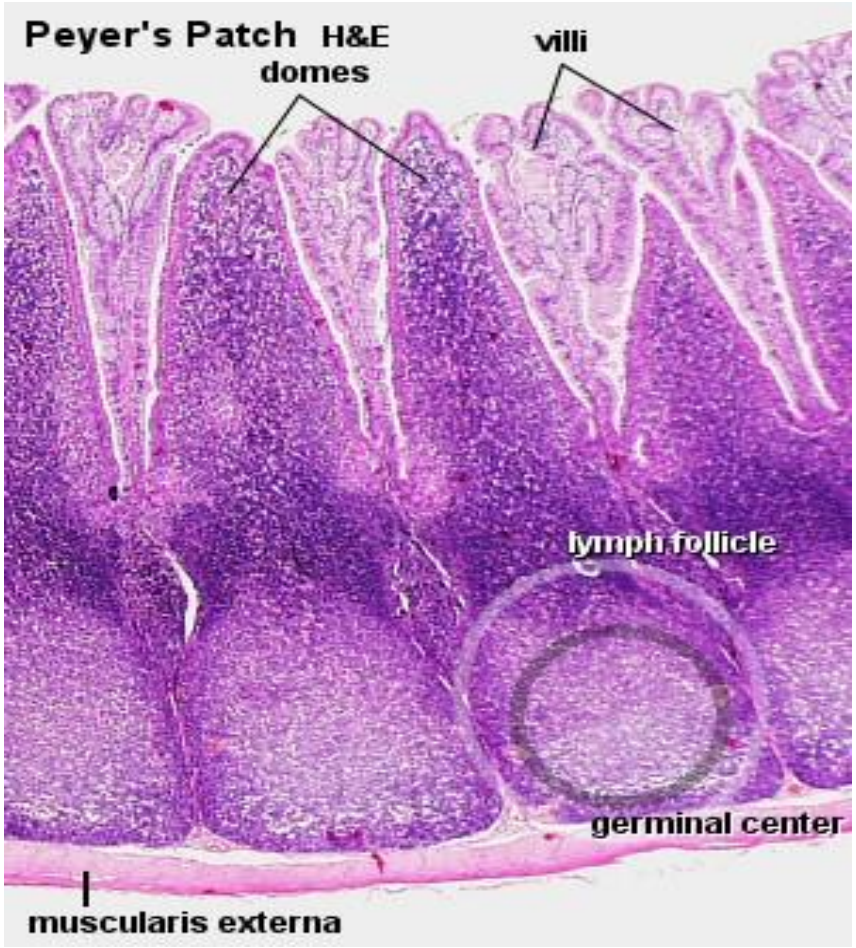
Absence of Brunner's glands.



Ileum

Presence of lymphoid aggregations in lamina propria known as **Peyer's patches.**

Villi are short & finger like.



Large Intestine

It consists of: appendix, colon, rectum and anal canal.

Mucosa: Absence of Plicae circulares and villi

Presence of Microvilli

Presence of Crypts of Lieberkuhn

Presence of Goblet cells in large number

Submucosa

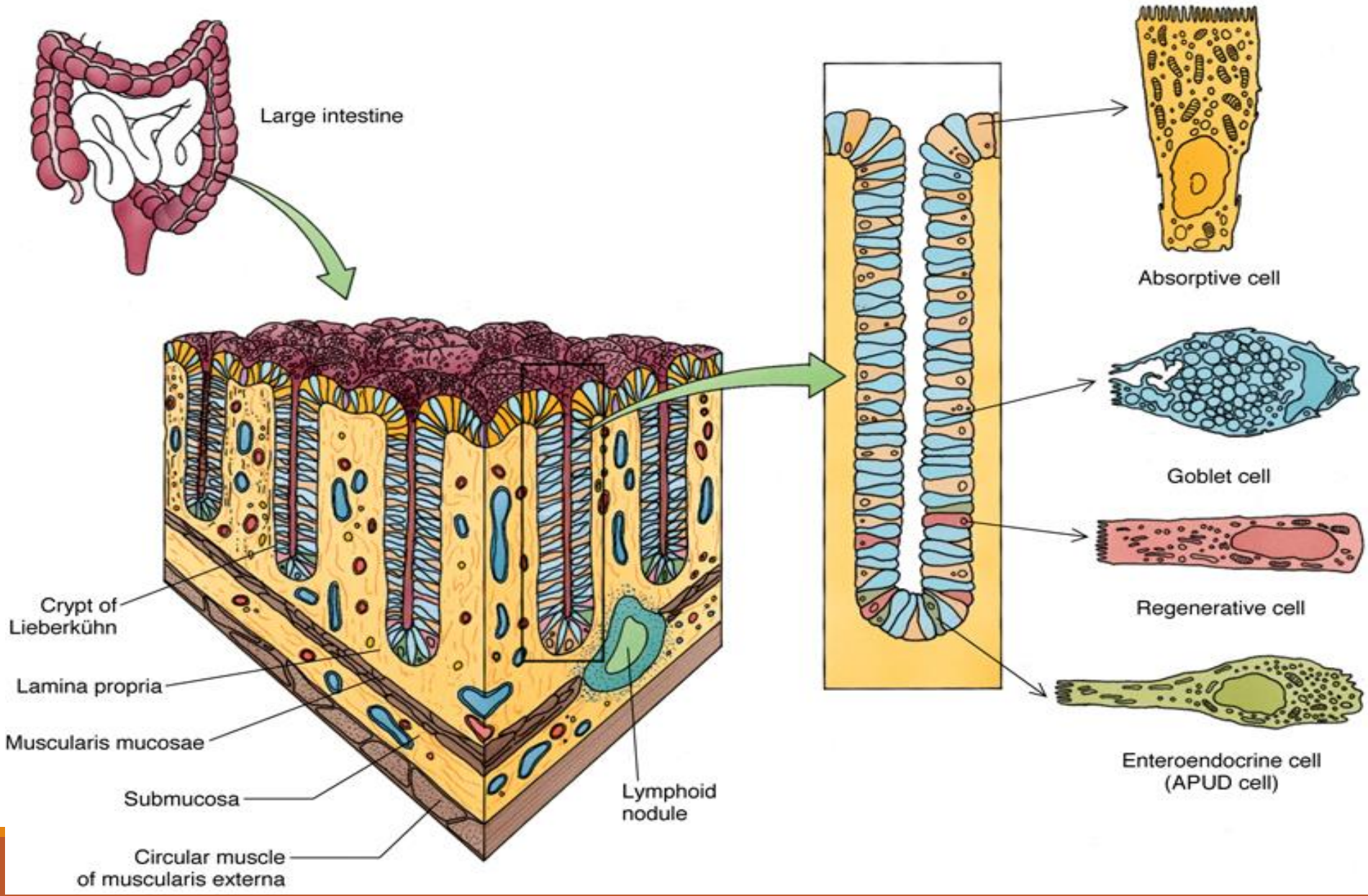
Muscularis externa:

Inner circular layer - thin compared to small intestine.

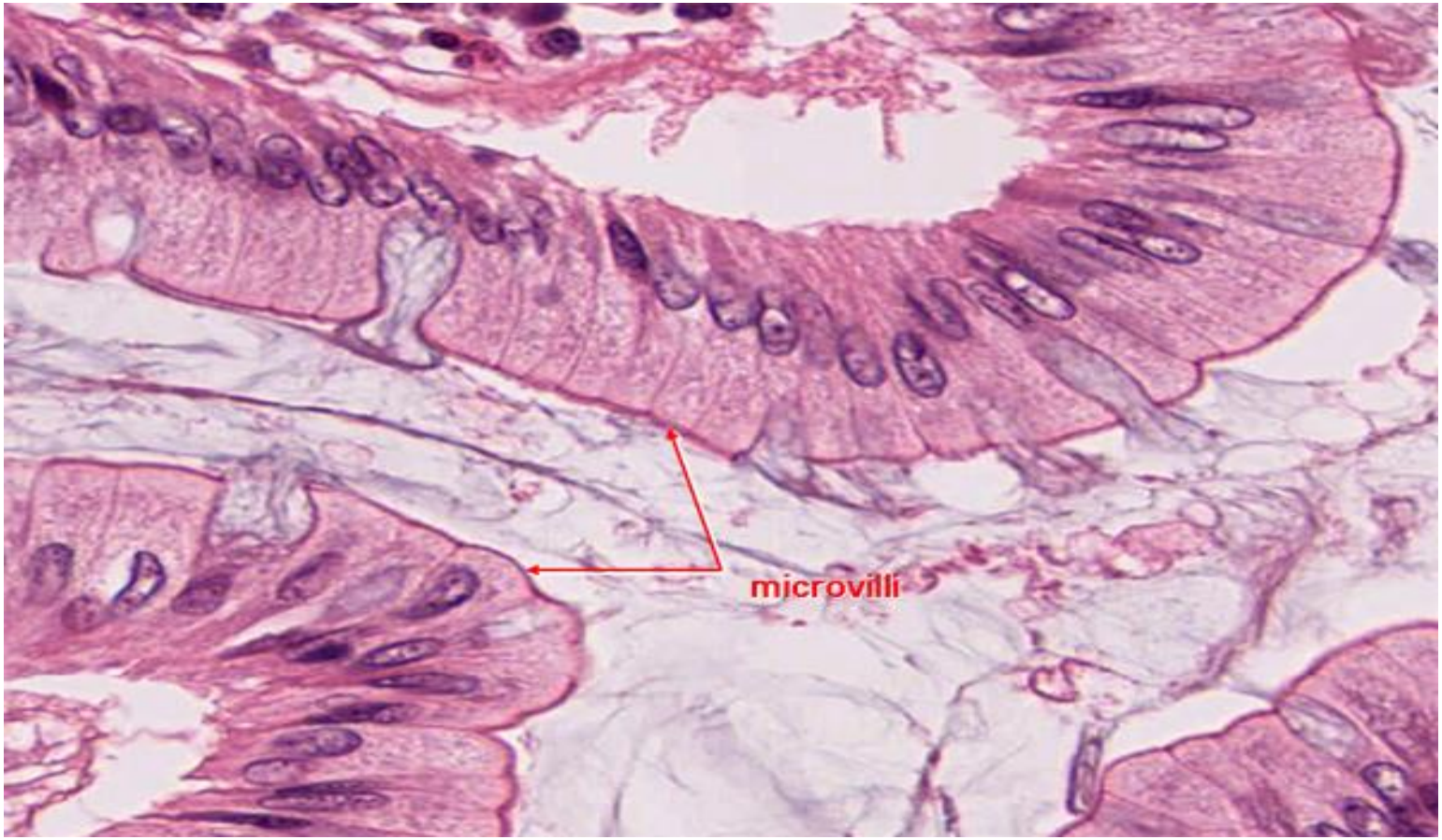
Outer longitudinal layer- forms Taenia coli.

Adventitia: Appendices epiploicae (peritoneum forms pouch like processes filled with fat)

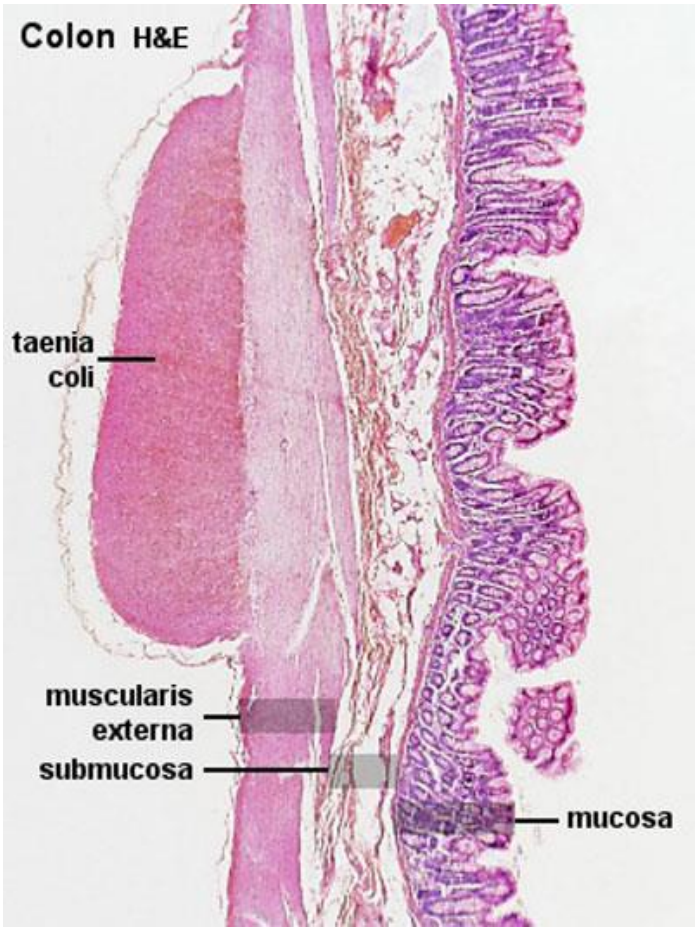
Large Intestine

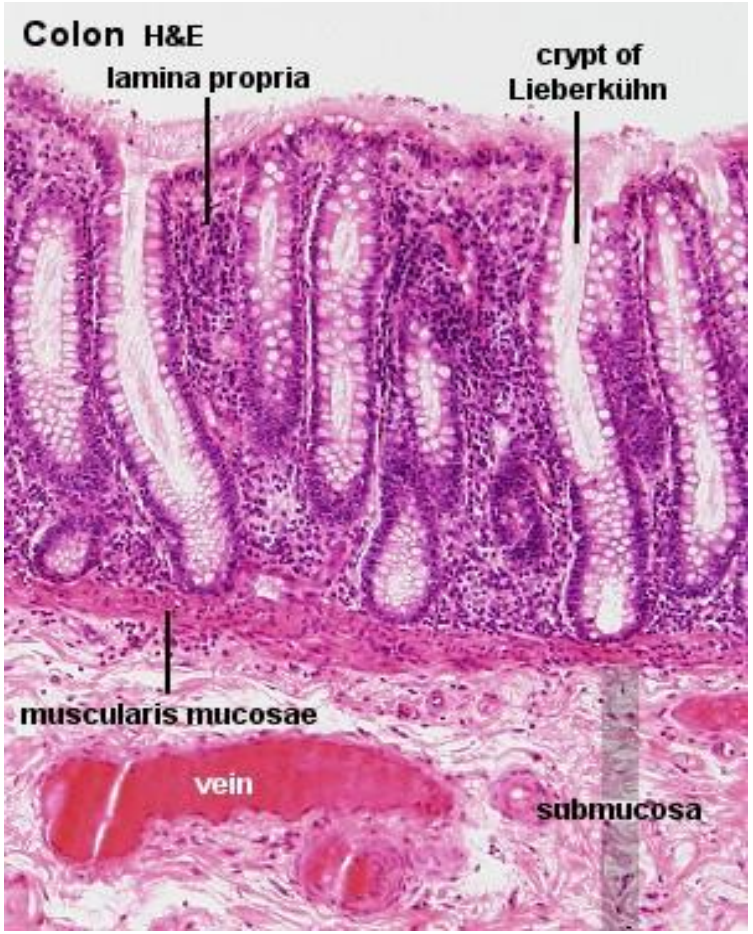


Magnified view of a villus



Large Intestine





Vermiform Appendix

A small blind-ending diverticulum.

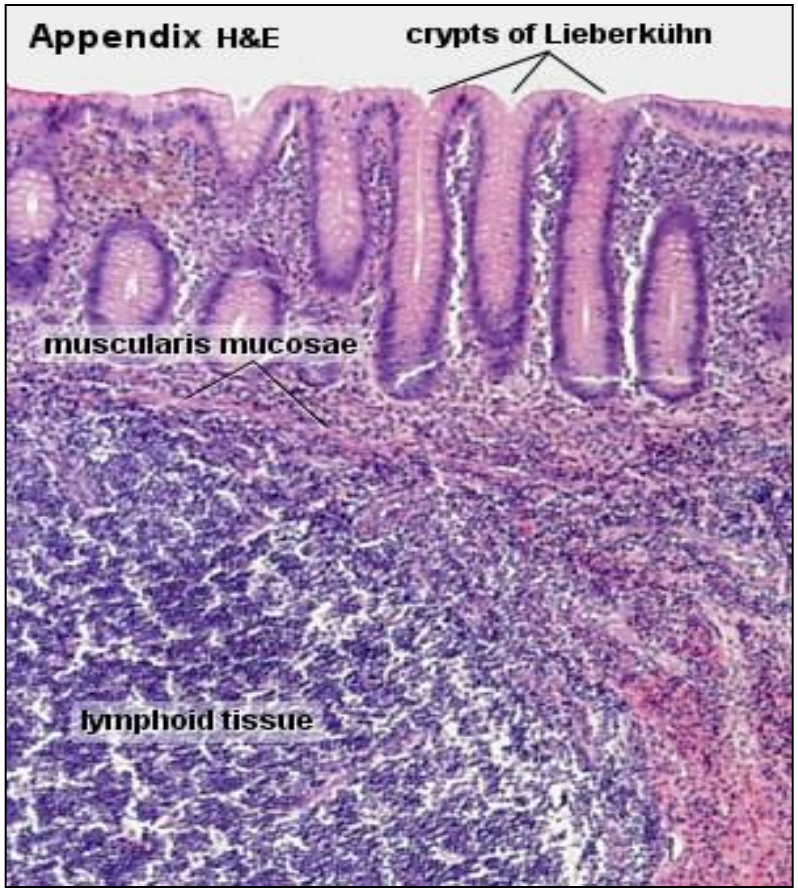
Large accumulations of lymphoid tissue in lamina propria which may extend into submucosa.

Intestinal villi are usually absent.

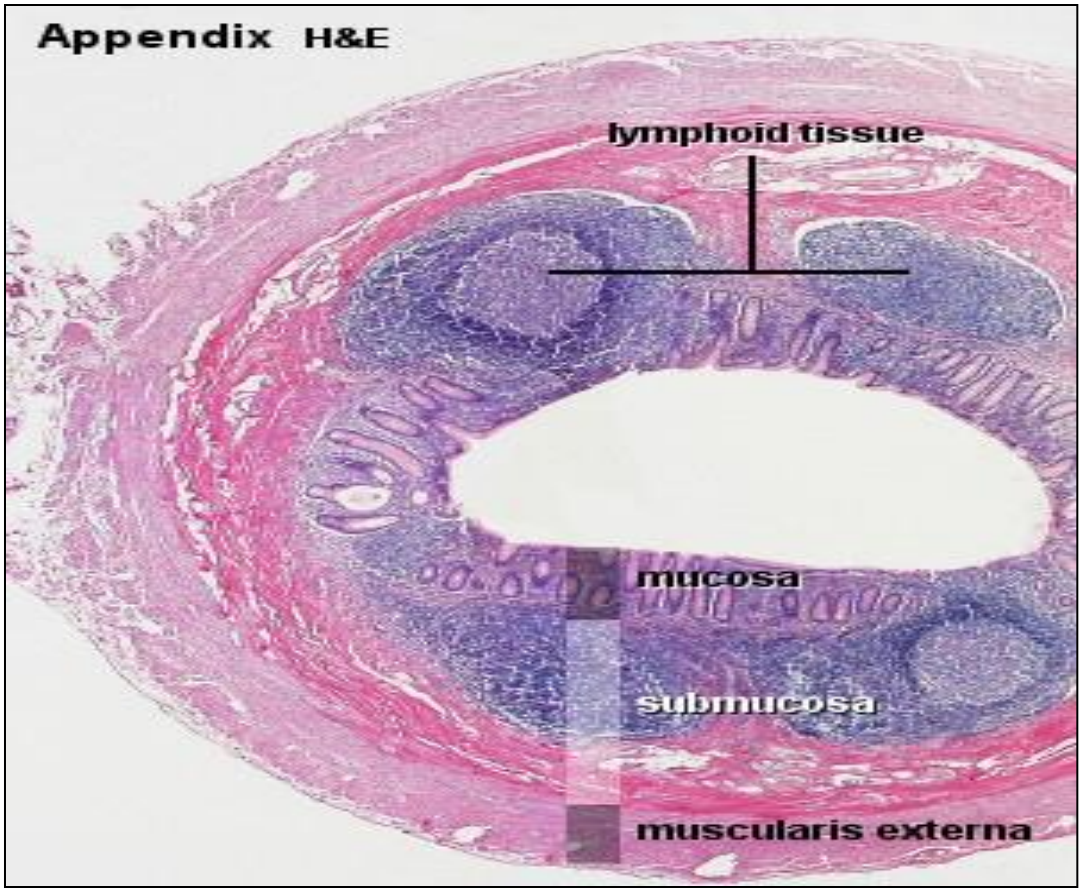
Crypts are poorly formed.

Muscularis externa is thin.

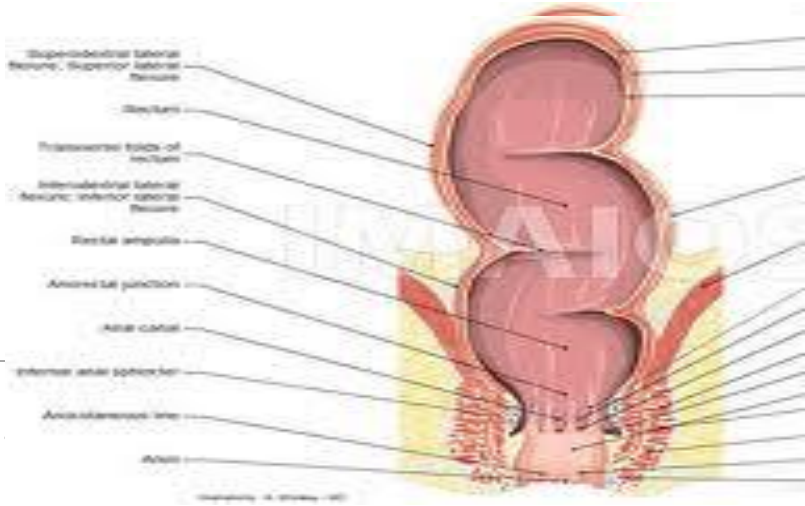
Absence of taenia coli.



Vermiform Appendix



Rectum

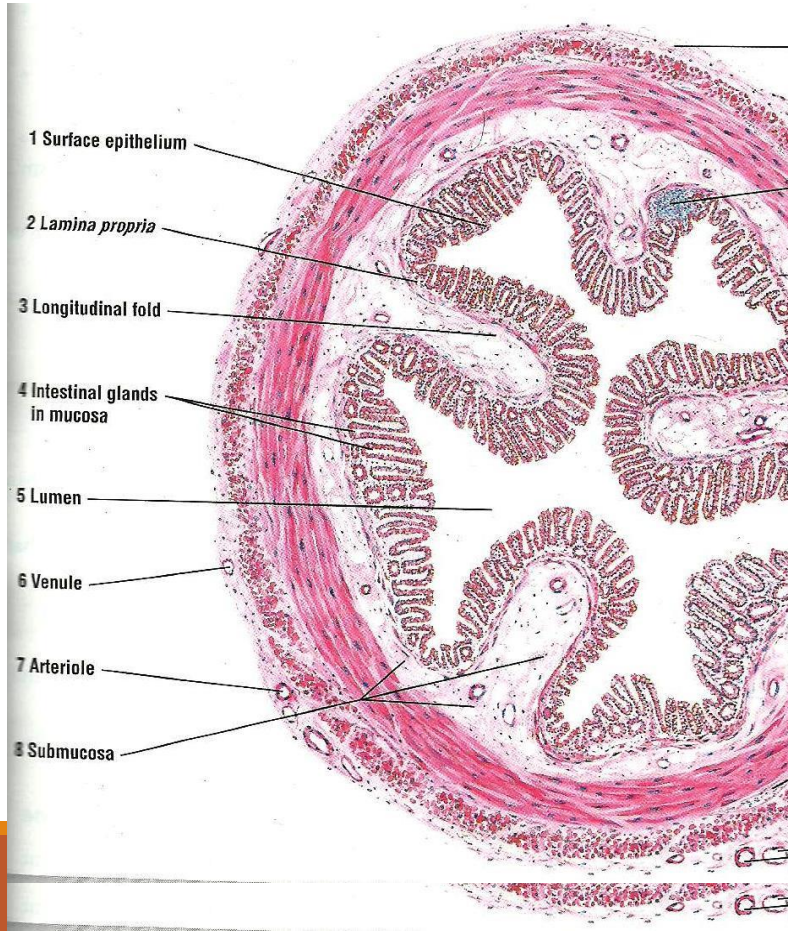


Intestinal glands are straight, like test tube

A continuous coat of longitudinal muscle is present.

Absence of taenia.

Absence of appendices epiploicae.



Anal Canal

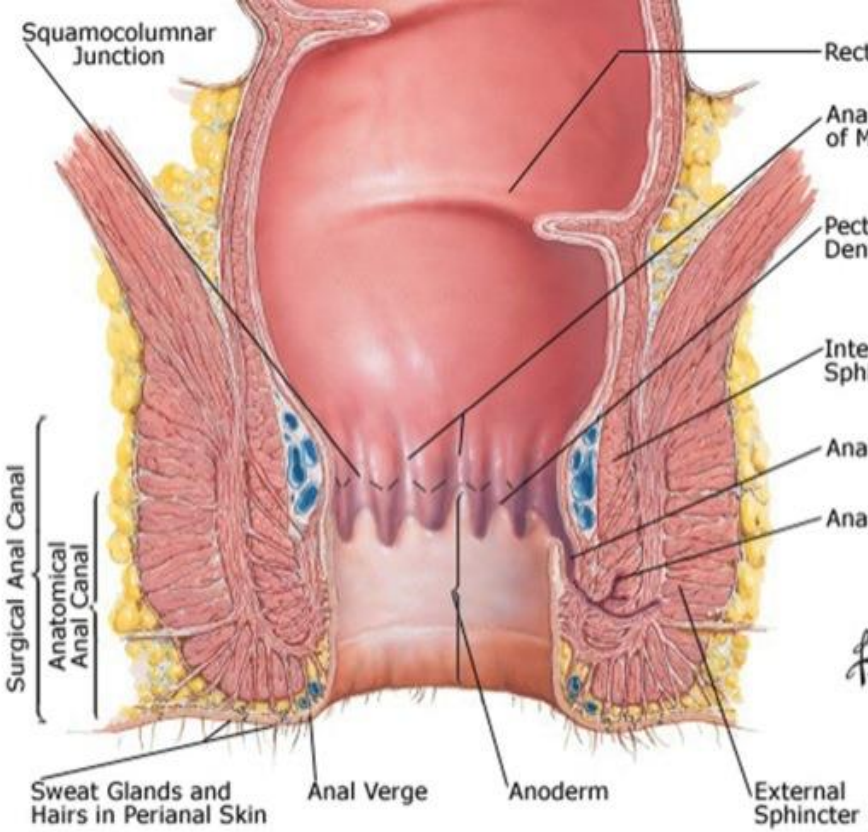
Epithelium: upper part-simple columnar, middle part-stratified squamous non-keratinized, lower part covered by true skin.

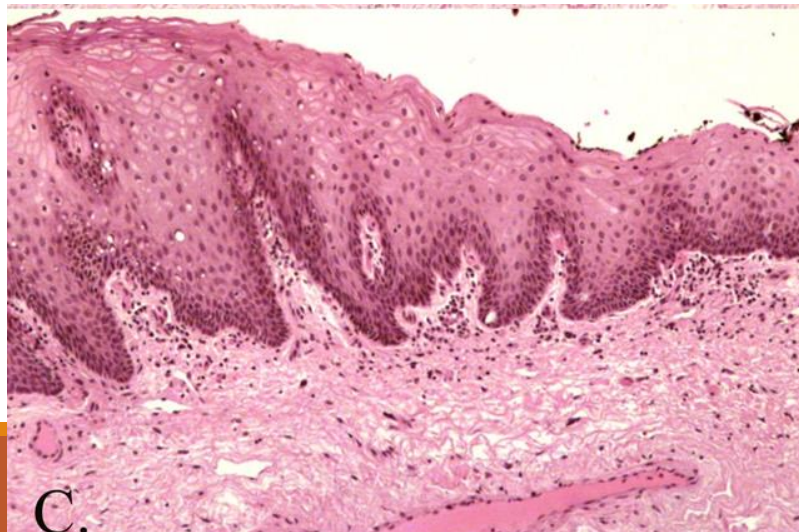
Mucosa has characteristic longitudinal folds-**Anal columns**.

Small mucosal folds between the anal columns -**Pectinate line**.

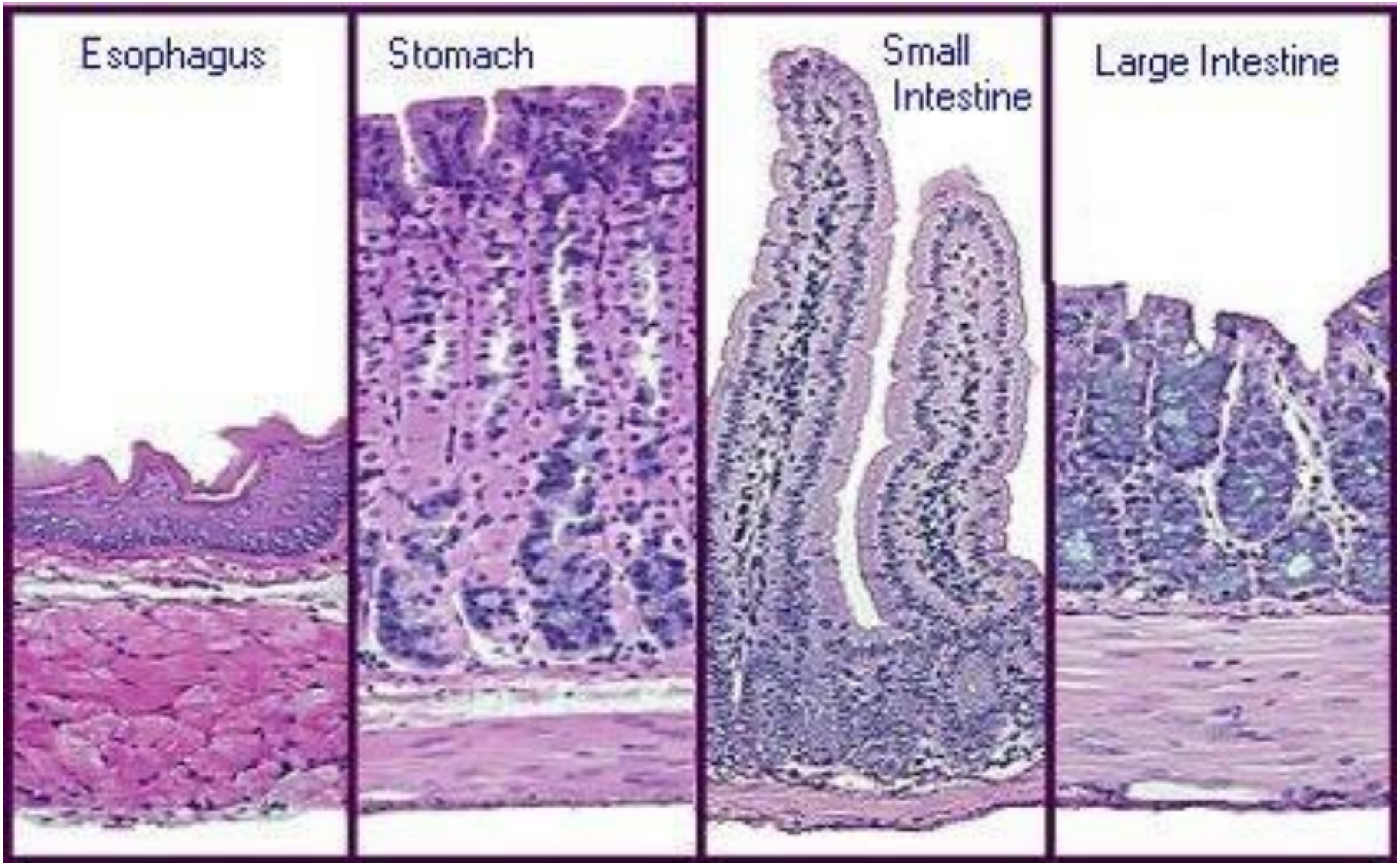
Crypts disappear below this line.

Muscularis externa-circular muscle forms involuntary **internal anal sphincter.**





Ano-rectal Junction


Esophagus
Stomach
Small Intestine
Large Intestine